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AN

ESSAY

ON

MINERAL, VEGETABLE, ANIMAL, AND AERIAL

POISONS;

INCLUDING

THE GENERAL SYMPTOMS, TREATMENT, TESTS, MORBID APPEARANCES, &c.

WITH THE

MEANS OF RESTORING SUSPENDED ANIMATION.

SECOND EDITION.

BY JOHN STEGGALL, M.D. &c.

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Author of a Manual for Apothecaries' Hall, Introduction to Botany, an Essay on Poisons, Translation of Gregory's Conspectus, Celsus, &c.

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PREFACE.

A second edition of the following work on Poisons having been called for, advantage has been taken of the recent discoveries, and improvement made in that branch of Toxicology which relates to Tests.

These are all stated on the authority of the most esteemed writers upon the subject of Toxicology, such as Orfila, Christison, Foderè, and others, and have been selected in proportion to their apparent certainty of operation. It is not presumed that a concise compilation, like the following, can in any degree rank as a substitute for the elaborate works of Christison and Orfila, &c., still a condensed view of the subject may

claim the consideration of many who would shrink back dismayed by the amplitude of very voluminous works; and it likewise may be the means of exciting inquiry beyond what the subsequent pages can supply.

November, 1832.

AN

ESSAY ON POISONS.

GENERAL AND INTRODUCTORY REMARKS ON POISONS.

There are four kinds of poisons, viz. Mineral, Vegetable, Aerial, and Animal.

A poison is defined, by modern writers, as a substance which, on being applied in some way to the human body, is capable of destroying the action of the vital functions, or of placing the solids and fluids in a condition that prevents the continuance of life. Foderé considers poisons to be those substances which are known by physicians as capable of altering or destroying, in a majority of cases, some or all of the functions necessary to the support of the vital principle.

A considerable variety exists in the comparative danger of poisons, as well as in the rapidity of their individual action. Animal poisons are, probably, the most speedily and certainly fatal; though, in both respects, they would seem to be equalled by some of the

vegetable kinds, when introduced by puncture into the system; for instance, by means of the poisoned arms of savage nations, &c.: next in order are the mineral: and lastly, the vegetable poisons. The latter, though generally slower in their operation, are often no less destructive.

There are various ways by which poisons may be introduced into the system: through the nose, in the form of odours; through the lungs, by inspiration; by the mouth and œsophagus, in the form of food; by the anus, in the form of injection; through the skin, by absorption, and, very rapidly, by recent wounds.

In noticing poisons individually, two modes of arrangement have been pursued by writers; the one founded on the basis of natural history, and the other upon the action of these substances on the living system. The latter, of late years, has been most generally adopted by authors on toxicology, with, however, considerable variety as to their classification. There are, nevertheless, some objections to following it implicitly in a work on medical jurisprudence; since, in addition to its allowed imperfections, it is arranged principally on a view of symptoms. It is, notwithstanding, not impracticable to combine both, in such a manner as to increase their respective utility: for instance, nearly all the corrosive poisons of Foderé and Orfila belong to the mineral kingdom; and the septic, to the animal; while the acrid, narcotic, and narcotico-acrid, divide the vegetable kingdom.

Dr. Christison classifies poisons under three heads, viz. *Irritants*, *Narcotics*, and *Narcotico-Acrids*; thus

abolishing or omitting the septic or putrefiant class of Orfila. This arrangement, being the most simple and sufficient for all practical purposes, will be adopted and adhered to in the following pages.

SIGNS OF POISON ON THE LIVING BODY.

A poison is supposed to have been taken or administered, if a person, when in a state of perfect health, after taking some food or drink, is attacked with violent pain, cramp in the stomach, nausea, vomiting, convulsive action, and a sense of suffocation; or if, under the same circumstances, he is seized with vertigo, delirium, or unusual drowsiness. These are the most striking primary symptoms; all of which may, however, be the effect of sudden disease: and here the medical attendant is called upon to ascertain whether an epidemic or sporadic disease, resembling that of the patient, exists. He should also inquire into his strength, mode of life, and habit of body, and ascertain whether he had previously complained of ill health; the time at which the suspected substance was taken, and the vehicle in which it was given, the taste or smell that was detected on its administration, and the food or drink that has been lately swallowed. These are all subjects requiring particular attention: the next, to which class of poisons the one taken belongs.

As already observed, the symptoms of poisons are sometimes equivocal and unsettled, yet there are certain

leading and characteristic appearances which, in a majority of cases, are, sufficient to distinguish the leading divisions of poisons from each other.

SYMPTOMS, &c.

Symptoms of an irritant Poison.* A corrosive or acrid poison may be considered to have been swallowed if the patient has observed that the food or drink, which was its vehicle, had not its ordinary taste; if he has felt heat, irritation, or an extraordinary or sudden dryness at the root of the mouth and œsophagus, with a sense of constriction in those parts; if these be succeeded by an obstinate anxiety to vomit, and sharp pains in the stomach and intestines; if there be great thirst, copious discharges by vomit and stool, accompanied with tenesmus, and followed by a hiccup, by a feeling of tightness across the diaphragm, and a difficulty of breathing; if there be great pain in the region of the kidnies, followed by strangury; if convulsions, cramps of the hands, trembling of the lips, extinction of the voice, repeated fainting, cold sweats, and a small chorded, and irregular pulse, be present; and if, in addition to these, the intellectual faculties remain

* Synonymous with the term irritant are the corrosive and acrid poisons of some authors. This class may be made to embrace five orders, viz. *metals* and their compounds, *acids* and their bases, *alkalies* and their compounds, *vegetable* and *animal* irritants, and *mechanical* irritants.

almost perfect, until the disease arrives near its fatal termination.

The Symptoms of Narcotic Poison are stupor, numbness, a great inclination to sleep, coldness and stiffness of the extremities, cold, clammy sweat, swelling of the neck and face, protrusion of the eyes with a haggard cast of countenance, thickening of the tongue, vertigo, weakened eyesight, or objects presented to it in a fantastic form, coma, delirium, general debility, palpitation of the heart, the pulse at first full and strong, but afterwards unequal and intermitting, paralysis of the lower extremities, retraction of the lips, general swelling of the body, and dilatation of the veins. At the conclusion of the disease, slight convulsions and pain are sometimes present.

Symptoms of Narcotico-Acrid Poisons. According to the arrangement of Foderé, it will be seen that the narcotico-acrid poisons are distinguished by a combination of several of the above symptoms: namely, agitation, pain, acute cries, sometimes stupor and convulsive motion of the muscles of the face, jaws, and extremities; vertigo, and occasionally extreme stiffness of the limbs, and contraction of the muscles of the thorax; the eyes red and starting from their sockets, the pupils frequently dilated; insensibility to external impressions; mouth full of foam; tongue and gums livid; nausea, vomiting, frequent stools: often these symptoms attack in paroxysms, and the patient is left comparatively easy for a few minutes.

After this enumeration, it may not appear difficult to detect the nature of the poisonous substance that has been swallowed; still, in ordinary practice, there is often considerable difficulty in arriving at a just conclusion. There are substances very distinct in their characters, which produce similar effects: as, for instance, cantharides, acrid vegetable substances, and caustic minerals. All these belong to the class of irritants, and generally exhibit similar symptoms. The difficulty is also increased, when it is recollected, that usual and innoxious substances, as far as concerns their poisonous nature, sometimes cause the most alarming symptoms. Foderé observes that he has seen a roasted chesnut produce all the symptoms of poison, until a dose of tartar emetic dispelled its influence. On the other hand, a variety is frequently observed in the symptoms excited by the same poison, in different individuals. Several causes may conduce to this, such as the mode in which it is exhibited. A poison given in the liquid form is generally more rapid and better marked in its effects than when it is exhibited in the solid state; and the substances previously or subsequently taken, may also modify the symptoms. Instances of which are to be seen in the works of all writers on toxicology. Poisons may also be administered to several persons at once, as at an entertainment, and the symptoms that follow be so various as to render the cause doubtful, were it not understood that such consequences are of frequent occurrence.

Diseases and Symptoms most likely to be mistaken for the Effects of Poison.

The diseases and symptoms most likely to be mistaken for the effect of poisons are probably those arising from idiosyncrasy, indigestion, and sudden illness.

Idiosyncrasy is an inexplicable circumstance in the animal economy; and, however extraordinary it may appear at first sight, it is no less true that individuals will have an antipathy to some particular article of diet; and, in some instances, the bare view of it, and in others, the eating of it, will produce the most alarming consequences. But the most striking cases of resemblance to the effects of poison probably occur in those who, after being long accustomed to a particular species of food, for the first time use another kind.*

As regards *indigestion*, extraordinary symptoms will frequently occur, in which the most violent and uncommon effects exhibit themselves. This is particularly the case with those who live in a luxurious manner, eat mushrooms, and truffles, or shellfish, during particular seasons of the year: if violent pain ensues, the stomach is attacked with spasmodic constriction, green matter

* The town of Martignes, in France, is almost exclusively inhabited by fishermen who have lived on fish from their infancy. Foderé, during the first year of his residence there, often prescribed meat soups to his patients; but, in every instance, their administration was followed by violent nausea and vomiting. They confessed that it was the first time they had used any aliment prepared from meat.

is vomited, and it would certainly be believed that a poison had been maliciously administered, were it not known how vitiated the bile may become, and what powerful efforts are necessary in a weak stomach to throw off indigestible food. It is proper to recollect that such symptoms may occur even in the midst of a repast; and caution is here required, so as not to confound the causes with the effects of poison.

Sudden Illness. Under this consideration the following circumstances are worthy of attention:

The season of the year and the prevailing epidemic. Thus, cholera morbus rages in the summer and autumn, and as colick and vomiting may then be said to be epidemic, we should not, of course, be so much surprised at their sudden appearance as if they came on in winter.

The former habits of the patient, his mode of life, state of health, should be ascertained; and, if possible, it should be learnt whether he may not have some concealed disease. Sudden death is sooner to be expected in a sickly person than in one who has previously enjoyed perfect health.

It should be noticed whether or not fever be present. It is an uncommon circumstance, that internal diseases of a fatal kind, and of the nature now before us, are present without more or less fever. The first operations, however, of poison, are not accompanied with it.

Rupture and digestion of the stomach have also been noticed by writers. We are indebted to Mr. Travers and Dr. Crampton for some instructive cases of the former. The patients in the midst of health are seized

with the most acute and unremitting pain in the stomach, and a rigidity and contraction of the abdominal muscles, and death ensues after a few hours' illness. On dissection, the contents of the stomach are found in the cavity of the abdomen, and a perforation is discovered, resulting from an ulcer of the mucous coat.

It will immediately occur to the reader, that a termination so sudden and fatal may lead to suspicion, and the appearances exhibited on dissection would, in some degree, strengthen this, were it not understood that death has occurred and may occur, from the natural cause in question, without the intervention of poisonous substances.

DUTY OF THE MEDICAL PRACTITIONER WHEN CALLED TO A CASE OF SUPPOSED POISONING.

Although a minute and accurate notice of symptoms is worthy of the strictest attention, it nevertheless only forms the commencement of the inquiry in cases of supposed poisoning. It is the duty of the medical attendant to examine every article of a suspicious nature, such as phials, boxes, or papers, containing powders. These should be carefully laid aside without remark. The clothes should be carefully inspected, for, in case of the strong acids being taken, it is seldom that they escape without being spotted or destroyed. If the patient preserve his senses, much necessary information may be obtained from him; and possibly,

also, the remainder of the fluid or substance which may not have been completely taken, may be procured. Should this be impracticable, the matter ejected from the stomach ought to be preserved, as also the linen or sponges used to collect the fluid which may have been deposited on the floor of the chamber, and a sufficient quantity should be sealed up, and preserved for analysis by some competent chemist. With this intention the following directions are to be scrupulously attended to.

Never make any experiment on the suspected substance without repeating them on ingredients that are deemed analogous, and in which the quantity of poisonous matter found in the stomach or intestines is ascertained. For this purpose several ablutions should be made of substances which it is supposed may probably resemble the poison given; and, from the result, a comparison can be instituted.

Again, the analysis should never be commenced until the tests are all prepared, and their accuracy determined. The order of proceeding should be previously laid down in the mind of the experimenter; and, when ready, he should make all his experiments at one time. The risk of losing a part of the suspected substance, from employing inconclusive experiments, is thus avoided.

If the quantity of matter received be sufficient, it should be divided into small portions, so that the various tests can be applied to each; but, if there be only a very small quantity, the symptoms should be carefully considered, in conjunction with the indica-

tions they present, and an opinion afterwards formed as to the poison most probably employed. In prosecuting this examination, it is, comparatively speaking, of little consequence, whether a decisive opinion can be formed as to the quantity administered: it is sufficient to prove the nature and quality of the substance.

Chemistry, which thus lends its aid in detecting mineral substances, is insufficient in determining whether a vegetable poison has been swallowed. In the latter cases, a conclusion is to be drawn from the train of symptoms that are present, and the substance itself may be also evaporated, to ascertain the presence of resin or extractive matter. This is generally all that botany or chemistry can do, for although the ultimate principles of vegetables may be obtained, there is very little certainty whether they belong to noxious or innoxious, plants.

The kitchen utensils should always be inspected, for it may turn out that a copper vessel, badly tinned, may prove the sole cause of these violent effects; and it should also be remembered, that the green colour frequently observed in the matter vomited, may be owing to vitiated bile, as well as to a mineral or vegetable poison.

It is an ancient direction, that part of the suspected substance should be given to some animal, in order to put its injurious principle to the test. This, however, is an ambiguous testimony, and not to be relied on, from the well-known fact, that many articles, poisonous to man, are found to be innoxious to animals; it is, therefore, a point of considerable moment, to ascer-

tain on what animal the substance under inquiry is most likely to produce effects similar to what it does on man.

It ought also to be remembered, in connexion with the circumstances under notice, that the human fluids, and particularly the bile, may, from disease, acquire such an acrimony as to be fatal to animals.—*Morgagni*, vol. ii. epist. 59, p. 396.

Hitherto, the subject of poisoning a person in a state of health has only been considered. To this may be added, that poisoning is often attempted on individuals who are ill, and the difficulty of distinguishing the symptoms of disease from those of poison is proportionably increased. It may be said, that the disease has taken a sudden turn, that the medicines used have been prejudicial, and that present appearances are a convulsive or final effort of the system. In such cases the medical examiner should pay particular attention, if required, to the following circumstances :

The sudden occurrence of symptoms which do not usually accompany the disease under which the patient labours; e. g. we should feel suspicious, if, in an ordinary case, nausea, vomiting, hiccup, faintings, cold sweats, with bloody stools, should suddenly and rapidly follow each other; or, again, if stertor, delirium, or insanity, should supervene in a case of common disease.

Moral circumstances should no less be attended to. These should not be allowed to prejudice the mind though the medical examiner should not overlook them. It should be ascertained whether any enmity exists between the sick person and any one who is attending

him; if so, inquire whether any poisonous substances have lately been purchased; whether these are still in the house; whether the alarming symptoms came not immediately after taking a drink, or any other substance of an innocent nature; and particularly ascertain whether any thing has been given without the orders of the physician, or by a person ignorant of medicines.

Slow Poisons. If the discovery of poisons, whose distinguishing character is the rapidity of their effects, be enveloped in difficulties and doubts, how much greater must be the uncertainty when medical men are required to ascertain the administration of what are termed slow poisons. This, however, is a subject so closely allied to popular superstition, that there is no little difficulty in separating truth from falsehood.* There is, however, a certain class of poisons which are slower in their operations, and, hence, more readily to be confounded with the effects of disease; for instance some of the salts of Lead. It is also possible that minute portions of the acrid poisons, administered from time to time, may gradually cause irreparable injury to the digestive and lymphatic systems, and finally destroy life. In such cases a medical examiner should not mistake a disease, or the effects of a bad constitution, for the consequences of noxious substances. The symptoms of the individual should be noticed for a

* In Italy it was formerly said that poisons were invented to destroy life at any stated period, from a few hours to a year. This, however, is a mere fiction, and it is now well understood, that no substances are known which will produce death at a determinate period of time. It is to Professor Bushman we are indebted for a very elaborate article on secret poisoning.

length of time; and the state of his health previous to his last illness well understood.

It is also of much importance to ascertain whether some impropriety in food or medicine has not led to the present result, and comparison may be made with the known effects of slow poison: first, a depraved, and then a destroyed appetite; weakness, marasmus, depression of spirits, a slow fever, chills, and heat, &c. Lastly, dissection should exhibit appearances distinctly referrible to the supposed noxious cause.

It is a question of considerable difficulty, not unfrequently, to determine whether poisoning be the result of suicide or homicide. An opinion on this subject is only to be formed from moral considerations, and attention to the following circumstances:

1. The previous state of mind of the deceased; whether he has been subject to delirium; if he has met with losses; has been disappointed in his hopes; or is suffering under disgrace.

2. Whether any of the persons with whom he lived or associated had any interest in his death.

3. The season of the year. Foderé observes that suicides are most frequent during the period of the solstices and equinoxes.

4. Did the patient, instead of complaining, remain quiet, seek solitude, and refuse the assistance of medical men and medicines.

5. Has any kind of writing been left by the individual expressive of his last wishes? As this is the most common, so it is the most certain proof of self-destruction.

6. Has any portion of the poison been found in his

pockets or in his chamber? This is evidently a very equivocal proof, since it may be quite as easy to be put there by others as by himself.

It may sometimes occur that a false accusation of poisoning may be attached to some one: and great illness, to give this accusation more force, pretended. In such cases, the person complaining should be tested by the rules already laid down; and a protracted examination will scarcely ever be necessary to develop the deceit.

Dissection and Post-Mortem Appearances.

In regard to post-mortem appearances, dissections will prove most satisfactory and conclusive, if the examination be made in as short a time as possible after death, since putrefaction generally commences in the abdominal viscera, the very organs that require the strictest investigation.

There is much difficulty and confusion, in cases of incipient or actual gangrene, in distinguishing the spots or blotches thereby produced, from those caused during life. The following distinction, however, is suggested by Mahon, which is evidently founded in truth: "If the stomach preserves its natural colour, and the spots on it are marked with red, while the borders of ulcers are also of a vivid or pale red colour, we are sure that that the cause has operated during life; but if the stomach and its spots are livid and pale, we should attribute the appearance to putrefaction, and attach no value to it."

It is no less worthy of recollection, that the fluids and solids of the human body may be coloured by

various alimentary substances or medicines, if their use be long persisted in; which ought to caution us against depending too much on a single phenomenon, but, on the contrary, to view all known facts in connexion, and then deduce a judgment from them.

Poisons may be introduced into the system, as already mentioned, by means of injection; it is obvious, therefore, that it will be useless to look for their indications in the stomach or smaller intestines; the whole intestinal canal, should be examined, from the mouth to the rectum. The vagina should also be inspected.

It frequently occurs that the bodies of persons supposed to be poisoned, are disinterred several days after death, for examination. In these cases, before investigating the particular instance, the season of the year, its dryness or humidity, the winds, and, indeed, every thing that can be more or less favorable to the preservation of dead bodies, should be taken into the account. It is certainly established beyond a doubt, that a body buried for a length of time will be more free from putrefaction than another that has been kept unburied for the same time. It may also happen, that the poison given has been of a drying nature, and of a kind that seems to delay decomposition—corrosive sublimate is said to do this; and if any thing of such a nature be noticed, it should be mentioned in the report. As a general rule, the examination of bodies in this situation should not be totally neglected: the medical jurist has only a more difficult task to perform. He must state the circumstances that are present; mention the progress of putrefaction; and clearly explain in what res-

pects it prevents the examination from being satisfactorily conclusive.

It is not necessary to enlarge on the affections which in numerous instances, have been known to destroy an individual suddenly. Dissection generally demonstrates the rupture of some large vessel, the effusion of blood on the brain, or some similar disease, as the immediate cause; and these occurrences cannot well be mistaken by a skilful anatomist, though the vulgar may be suspicious. So also when death follows, as is sometimes the case, from sudden gusts of passion. Here the viscera are generally in a natural state; and of course, as all lesion is absent, it will be impossible to infer that a noxious substance has been administered. It is a well known fact that sudden death is occasionally produced during the summer, or in a person much heated, by taking a copious draught of some cold liquid: in such cases there is nothing indicative of organic lesion, and a knowledge of the possibility of the occurrence from such a cause may remove all suspicion.

Having now concluded what may be considered as general and introductory remarks on the subject of poisons, it is proposed to take a view of the symptoms, and appearances on dissection, in various classes; noticing only such substances as are most frequently used for the commission of suicide or homicide, and the cases where the attendance and judgment of the medical practitioners are most frequently brought before the public.

METALLIC COMPOUNDS.

The poisonous substances belonging to the mineral kingdom are those most frequently used for the unchristianlike purposes of suicide or of homicide; consequently they are entitled to the earliest and most minute consideration.

The metals, of which the oxides and salts are most deleterious and most frequently employed with murderous intention, are the following: Arsenic, Mercury, Antimony, Copper, Zinc, Tin, Silver, Gold, Chrome, Bismuth, Iron, Lead.

ARSENIC, AND ITS PREPARATIONS.

According to chemical nomenclature, the substance commonly known under the name of arsenic is *arsenious acid*, or the white oxide of arsenic; and it has received these apparently incompatible names from the fact, that, though more analogous to the oxides, yet it possesses some of the properties of acids.

Natural History. Arsenic is an artificial production, and is principally prepared in Saxony, from cobalt ores. Whilst the latter, in the crude state, are roasting for the purpose of obtaining zaffre, the vapours arising from the oxide are condensed in a long and large

chamber, and to these potash is added. The mixture is then sublimed, and the white oxide is obtained, leaving potash with sulphur.

There are other forms of arsenic, or compounds, which are occasionally, though very rarely, used as poisons. They are the grey oxide or *Fly Powder*, as it is commonly called, which is obtained by exposing metallic arsenic to the atmosphere, *Liquor Arsenicalis*, the *Sulphuret*, or *Orpiment*, *King's yellow*.

Symptoms. Generally within half an hour, occasionally even ten minutes, after taking arsenic, great depression is felt, approaching to fainting, followed by burning pain in the stomach and bowels, with violent vomiting; there is heat in the fauces and œsophagus, with a sense of suffocation; pain and constriction felt about the thorax and diaphragm, frequent alvine evacuations, often bloody, painful micturition, feeble thready pulse, cold clammy perspirations, lividity of the extremities; towards the close there are convulsions, followed by death.

Treatment. Administer an emetic of sulphate of zinc. Excite and encourage vomiting by large draughts of sugared water, linseed tea, or other emollient fluids. Lime-water, or chalk and water, may be drank freely, if the arsenic has been taken in solution. Inflammatory symptoms are to be combated upon general principles; namely, by bleeding, general and local; fomentations; frequent emollient clysters, and other remedies, according to the urgency of the symptoms.

Antidotes. No specific antidotes are yet known.

Fat, oil, vinegar, charcoal powder, alkaline sulphurets, and vegetable decoctions, which have been recommended, are not to be depended upon.

Tests. The methods proposed for detecting the presence of arsenic, are

I. The application of certain reagents or tests to its solution.

II. Its reduction to a metallic state.

Of the first class, the following may be mentioned :

1. *Sulphuretted Hydrogen* ranks as the best test for the arsenic. The fluid tested must not be acid or alkaline; if the former, potash should be added to neutralization; but if the latter, a saturating quantity of acetic acid must be dropped in. Sulphuretted Hydrogen is then passed through the solution, and will cause a copious precipitate of a lemon yellow colour. It should be recollected, however, that an excess of the gas will dissolve the sulphuret of arsenic, producing only a milkiness; but which excess, when expelled by heat, will leave a clear liquid, and a decided precipitate.

In this chemical process a sulphuret of arsenicum is formed, and the oxygen of the acid combining with the hydrogen of the gas, produces water.

The sulphuret of arsenicum may then be put into a tube with black flux,* and heated. The arsenic sublimes, forming a metallic coating in the tube. This may be subsequently oxidated by the application of

* Black flux is made by deflagrating $2\frac{1}{2}$ parts of supertartrate of potash with one of nitre. The residue is a carbonate of potash with charcoal.

heat, or taken out and thrown upon redhot coals, and will emit a smell resembling that of Garlick.

2. *Ammoniacal nitrate* of *Silver.** This test throws down a precipitate of a yellow colour, which afterwards becomes brown by exposure to the light. It is an arsenite of silver, and nitrate of ammonia is left in the solution.

3. *Ammoniacal Sulphate* of *Copper*,† added to a solution of arsenic, throws down a grass-green precipitate of arsenite of copper, leaving sulphate of ammonia in solution.

Some other tests of arsenic have been proposed, but laid aside as ineligible, from their forming similar appearances with many other bodies.

Thus *Lime Water* forms white precipitate with carbonates, and sulphates, and is prevented combining with the arsenious acid by the presence of nitric, oxymuriatic, or acetic acids.

The *Chromate of Potash*, recommended by Dr. Thomas Cooper, produces with arsenic a grass-green precipitate, which is an oxide of chrome, whilst the arsenious acid unites with the potash.

This test is little insisted upon, as its relations have not been minutely investigated.

* Ammoniacal nitrate of silver is made by throwing down the oxide of silver from the nitrate, by liquor ammoniæ, which is still added till the oxide is nearly redissolved.

† This compound is formed like the former, by adding liquor ammoniæ to sulphate of copper; first precipitating, then redissolving it.

The most certain test for exhibiting the presence of arsenic is to reduce the metal as above mentioned, by calcining the dried suspected matter in a glass tube, with the black flux; when, if arsenic be present in very minute quantity, it will be sublimed, and adhere to the inside of the tube, in the form of a shining metallic coating, consisting of cubic crystals.

The garlic smell of arsenic may be detected by taking a portion of the suspected substance, and placing it on redhot charcoal, or a piece of redhot iron. It will evaporate with a white smoke, and a peculiar smell resembling garlick. This, however, is an uncertain and equivocal test; as phosphorus, zinc, and antimony burn with a similar odour; and even if it be arsenic, yet mixed with either a vegetable or animal substance, the smoke and smell arising from these bodies when heated will altogether prevent us from detecting the peculiar properties of the arsenic.

Another test proposed is that of forming an *alloy* with other metals, for which the following is the process.

Mix the suspected substance with black flux, and place the mixture between polished plates of copper; bind them tight together with iron wire, and expose them to a low red heat. If the included substance contains arsenic, a silvery white stain will be left on the surface of the copper, which is an alloy of the two metals. Dr. Bostock observes that copper whitened in this manner tarnishes very soon.

Reduction of the metal by the *galvanic pile* was suggested by Jaegar, and has been particularly noticed and recommended by Fisher; Dr. Christison, in his

work on Poisons, gives directions for performing the experiment. 2d edit., p. 249.

Detection of Arsenic when mixed with organic Solids and Fluids. The contents, and even the coats of the stomach cut up into shreds, are to be boiled with distilled water for half an hour: the liquid is then to be passed through a filter. To separate animal matter, acetic acid is added, which precipitates some portions of it. The liquid is then to be tested with ammoniacal-nitrate of silver, which will throw down a bright yellow precipitate if the liquid is sufficiently pure for the application of sulphuretted hydrogen. If not, the solution must be slowly evaporated to dryness, and distilled water must be repeatedly added, until the liquid is sufficiently clear from animal matter, when sulphuretted hydrogen will throw down the yellow precipitate, to be reduced and oxidated, as above described. For a minute detail of the process, vid. Christison, p. 251.

Morbid Appearances. The corrosive or acrid poisons generally produce inflammation of the first passages, constrictions of the intestinal canal, gangrene, sphacelus, and perforations of the parts. The inflammation, however, varies as to extent and intensity. Sometimes it affects the mouth, and extends to the duodenum, while in others it reaches through the whole space of the digestive tube. Again, the membranes are sometimes of a clear red colour, without any trace of ulceration; sometimes of a cherry red, with longitudinal or transverse patches of a blackish colour, formed by extravasated blood between the coats. Ulcerations are observed in various parts, particularly near the

pylorus. Another character of this class of poisons is, the separation of the mucous or villous coat of the stomach from the muscular, in such a manner that it and the serous remain perfectly isolated. This is mentioned by Hebenstreit as a striking proof; and his opinion is adopted and advocated by Mahon and others. The latter remarks that such a separation cannot take place unless some corrosive substance has been applied to the internal coat of the stomach; for it is impossible to believe the putrefaction could produce such an effect, and the folds and rugosities of the internal coat would not permit this sudden separation except from some powerful cause. He therefore insists on it as a most positive proof; and his opinion has met with the acquiescence of Foderé and Orfila.

The action of corrosive poisons is also sometimes extended to the other viscera, and the skin has occasionally become covered with black spots. Morgagni mentions the case of a woman poisoned with arsenic, and who had experienced very little pain from it, whose body, notwithstanding, was entirely black after death, on its posterior surface, from head to foot; while the lungs were gangrenous, and the stomach and duodenum perforated. In general, the lungs are of a deeper red than in the natural state, and it is not uncommon to find in them a bloody serosity. Baillon states that in case of sudden death, poison is often deemed the cause, if, on dissection, the left side of the lower part of the stomach contains dark coloured spots. But this should not be attributed to external causes, since it is occasioned by the blood itself, which settles in the branches

of the vasa brevia at death. Moreover, the slightest and smallest holes or erosions in the stomach should be carefully examined; and this will be best effected by holding the viscus between the eye and the light, as, by doing so, many apertures in its substance have been found, which otherwise would have eluded observation.

The most frequent morbid appearances produced by arsenic may be summed up as following: some redness of the pharynx and œsophagus; red and inflamed stomach, containing thick mucus, extravasated blood, and shreds of coagulable lymph; there is also a black appearance produced by extravasation of blood between the coats, and black warty excrescences; occasionally ulcerations, destruction of the mucous and muscular coats, and in rare instances perforation; inflammation, redness and congestion about the pylorus and duodenum, diminishing in the course of the intestines downwards till we arrive at the colon and rectum, the latter of which is often deeply reddened, and presents patches of ulceration, with excoriation about the anus. From numerous experiments and observations, it is agreed that bodies which have been deprived of life by arsenic, possess a remarkable power of resisting putrefaction.

MERCURY, AND ITS PREPARATIONS.

The preparations of mercury most likely to be taken as poisons, are, *corrosive sublimate, red precipitate,* the *subsulphate* (Turbith mineral), and *calomel.* The first is by far most frequently resorted to, and most rapid in its deleterious effects; therefore, to that one in particular most of the following remarks will be directed.

Symptoms. If corrosive sublimate be exhibited internally in large doses, and if its use be too long continued, it causes colic and vomiting. These are succeeded by affections of the salivary glands, ptyalism, swelling of the tongue and gums, destruction of the teeth, and swelling of the face and head. Cardialgia, diarrhœa, dysentery, phthisis pulmonalis, tremors of the limbs, paralysis, or even death, have been the consequence of persisting in such a course for an improper space of time. When an individual is poisoned by this mineral, the dose is larger and the effects are more immediate. The ordinary symptoms in such cases are, acrid, astringent, metallic taste in the mouth; a sensation of stricture, and burning heat in the throat; anxiety, and rending pains in the stomach, and throughout the whole of the intestinal canal; nausea, frequent vomiting of a fluid, which is often bloody, and accompanied with violent efforts; generally diarrhœa and dysenteric symptoms; pulse small and frequent; faintness; general debility; difficulty of breathing; cold sweats; cramps in all the limbs; general insensibility; convulsions; and death. *Orfila,* vol. i. p. 60.

In addition to the symptoms above enumerated, some observers have noticed a great diminution in the secretion of urine, with painful micturition; and in some cases, where the catheter has been introduced, the bladder has been found empty. The pain and stricture in the œsophagus are sometimes so severe as to cause the greatest distress in swallowing even the mildest fluids; and in one instance they were so excessive as for some hours to destroy the power of speech. *Edin. Med. and Surg. Jour.* vol. xiv. p. 468.

Treatment. Whites of eggs are to be mixed with water, and one to be given every two or three minutes, to promote vomiting and to lessen the virulence of the poison. Milk in large quantities, gum-water, or linseed tea, or sugar and water, should be administered. Gluten, as it exists in wheat flour, decomposes sublimate, and should be given mixed with water, &c. Inflammatory consequences are to be anticipated, and treated on the usual antiphlogistic and depleting principles.

Antidotes. Alkaline earths and salts were formerly in high repute as antidotes against corrosive sublimate, and cases are to be found in Medical Journals where they would seem to have cured the sufferers. They have also failed; and the same remark will apply to the sulphurets, the infusion of Peruvian bark, and sugar. It is to Orfila we are infinitely indebted for the introduction of albumen as an antidote to this substance. If taken in sufficient quantity, it decomposes the metallic salt, forming a triple compound, consisting of

chlorine, albumen, and calomel. Mucilaginous drinks are also very efficacious as accessory remedies.

Chemical Proofs. There is some difference among chemists as to the precise solubility of corrosive sublimate, but we shall probably be correct in stating, that from sixteen to twenty parts of distilled water at the ordinary temperature will dissolve one part. And this fact should be remembered, as it will prevent an unnecessary addition of fluid.

Tests. The tests suggested for the detection of corrosive sublimate are numerous, some being applicable to the suspected substance when in a solid, and others when in a fluid, state:

If a powder be collected, and is supposed to be corrosive sublimate, add charcoal and a little water to it, and thus make a paste. If this be submitted to the action of heat, in a close vessel, metallic mercury is obtained from the decomposition of the salt.

Mercurial preparations when heated to redness in a glass tube with potash are decomposed, the quicksilver being volatilized, and forming metallic globules when cooled.

Tests for corrosive sublimate in solution:

Protochloride of Tin, throws down a grayish black precipitate of mercury, which will run into globules by the application of slight heat.

Sulphuretted Hydrogen, throws down a brownish black precipitate of the sulphuret of mercury.

Hydriodate of Potash, throws down a scarlet precipitate of the biniodide of mercury. This, although a delicate test when the oxymuriate is unmixed, is pre-

vented acting characteristically by the presence of many salts and acids.

Lime Water, throws down a lemon-yellow powder, forming what is known as yellow wash.

Caustic Potash, produces a yellow precipitate.

Liquor Ammoniæ, throws down a white precipitate, similar to the white precipitate of the pharmacopœias.

Carbonate of Potash, gives a brick-red precipitate.

Albumen, forms a white precipitate, composed of chloride of albumen and colomel.

Galvanic Test, as proposed by Mr. Silvester, is very decisive. Place some of the suspected fluid on a piece of polished gold, and bring in contact a piece of iron, as a pen-knife; a galvanic action is excited, and a white spot or amalgam is formed upon the gold.

Corrosive sublimate, according to Orfila, is sooner or later decomposed, and converted into the submuriate by most vegetable substances, distilled waters, extracts, oils, syrups, honey, and gums. Muriatic acid gas is disengaged, and calomel is precipitated, with a portion of the vegetable matter, which has undergone some change.

Process for Organic Mixtures. Dr. Christison, who has most attentively studied this subject, proposes two modes of detecting mercury. The first is applied when it is present in larger quantity, the second where the poison exists in an extremely minute proportion.

In the first process, after making a mixture by boiling the suspected solids and fluids in distilled water, sulphuric ether is to be added, to take up the oxymuri-

ate. The ether is then to be removed from the surface, and tested by the usual reagents for mercury in solution.

In the second process, the mixture is to be treated with protochloride of tin, which will throw down a precipitate of a slate-gray colour. This is to be collected and drained on a filter, afterwards boiled with a solution of potash, to dissolve and remove animal matter; leaving, on cooling, a grayish black powder, which after frequent washing and heating will afford small globules of mercury. For a minute description of the process, vide Christison on Poisons, p. 338.

Morbid Appearances. Orfila, from the result of his experiments on animals, as well as of cases of poisoning in the human body, comes to the conclusion, that it is impossible, in the present state of science, to point out with precision "the seat, extent, and character, of the lesion produced by corrosive sublimate;" and the main argument in favour of this opinion seems to be the fact, that similar effects are produced by other corrosive poisons. But, though this may be allowed as a correct position, it is still necessary to point out the appearances that have been noticed. If they are common to other substances, there is only the disadvantage of repetition. In Dr. Henry's case, the external appearance of the stomach and intestines was perfectly natural. About two ounces of a thick yellowish ropy fluid were found in the stomach, which was but moderately distended with air. On its inner surface, numerous dark red spots, indicating inflammation of the villous coat, were observable. They extended

throughout the whole length of the smaller curvature, and occupied the greater part of the fundus, but did not appear in the lower portion of the large curvature. No abrasion of the villous coat was perceptible. The inner coat of the duodenum, as far as the middle of its length, presented the same appearance of inflammation. The lower part of the œsophagus, for about three inches above the cardia, was slightly inflamed; but higher up it was of a natural colour, and a small abscess was discovered in it, filled with pus. *The bladder was empty and exceedingly contracted.*

In the case related by Mr. Saunders,* the stomach generally was inflamed, and its cavity was lined with a considerable quantity of viscid and glutinous mucus, but there was nothing like corrosion or sphacelus. The liver, spleen, and other viscera, were not unhealthy.

In each of Mr. Valentine's four cases, he found the stomach greatly inflamed. Black circular patches, about three inches in diameter, were observed, and from them an extensive inflammation of the inner coat diverged in all directions. "In the child which died first, the texture was totally destroyed through all the coats, as far as the circular patch extended; and on washing off the destroyed parts, only the peritoneal covering of that part of the organ was left. It cannot be better compared," says Mr. V. "than to a piece of leather *burnt with a redhot coal*:" the interstices were highly inflamed; the gall-bladder in every case was greatly distended with bile; the peritoneum ge-

* See Lond. Med. Repos. vol. ii. p. 458.

nerally inflamed, as were also the mesentery and omentum. In one instance the kidneys were inflamed. *In all, the urinary bladder was much contracted; in the mother it was the size of a walnut, and in one of the children no larger than a marble.*

By comparing the result of numerous post mortem examinations after poisoning, by corrosive sublimate, it would appear that the most general morbid appearances are the following: redness of the pharynx and œsophagus, highly inflammatory appearances in the stomach, frequently with corrosion, or with deep ulcers, and occasionally perforation, redness of the duodenum and extensive inflammation in the colon and rectum, even occasionally ulceration ; congestion, and inflammation in the lungs, and sometimes of the heart and pericardium; redness and increased vascularity of the kidneys, and contracted urinary bladder.

It is remarked by Dr. Christison, and particularly deserving attention, that the slough thrown off by the corrosive effects of mercury, generally affords traces of that metal, upon the application of the proper tests.

ANTIMONY, AND ITS PREPARATIONS.

Tartar Emetic. In large doses, this substance must unquestionably be deemed a poison.

Symptoms. A rough metallic taste in the mouth; nausea; copious vomitings; frequent hiccup; cardialgia; burning heat in the epigastric region; pains of

the stomach; colic; inflation; copius stools; syncope; small, contracted, and accelerated pulse; cold skin, but sometimes intense heat; difficult breathing; vertigo; loss of sense; convulsive motions; very painful cramps in the legs; prostration of strength; and death. To these symptoms are sometimes added a great difficulty of swallowing, and deglutition may be suspended for some time. The vomiting and alvine secretions do not always take place, and the consequence of this is an increase in the violence of the other symptoms.

Treatment. Excite and encourage vomiting by tickling the fauces with a feather or the finger, and by large draughts of mild fluids; give cinchona bark in powder or tincture, and follow it up by the administration of opium, which is calculated to allay the excessive vomiting.

Antidotes. The best antidotes are decoctions of the astringent vegetables; such as, yellow cinchona,* oak or willow bark, gall nuts, strong tea, &c. which should be given freely, to dilute and decompose the poison.

Tests. When heated redhot in an earthen crucible with the black flux, it blackens and decomposes, leaving for a residue metallic antimony, and potash slightly carbonated, of a white colour.

* According to Dr. Paris, ℥j. of the decoction of yellow bark is capable of decomposing ℈j. of tartar emetic, and rendering it completely inert.

Sulphuretted Hydrogen, sulphuretted water, and the *hydrosulphurets,* when used in small quantities, throw down an orange yellow precipitate, and a deep brown red if employed in excess. This precipitate, after being dried and mixed with charcoal and common potash, gives, by the action of heat, a cake of metallic antimony.

Concentrated Sulphuric Acid produces a white precipitate.

Lime-water and *Caustic Potash* give a thick white precipitate, which is redissolved with facility by nitric acid. Barytic water produces the same effect as lime-water.

The infusion of Nut-galls produces an abundant precipitate of a dirty white colour, inclining a little to yellow.

Morbid Appearances. The mucous membrane of the stomach is usually red, inflamed, and covered with mucus. The duodenum is in a similar state, and occasionally the other small intestines. The lungs are often found more or less inflamed, and in some instances the brain also, and contains serous fluid. Hoffmann mentions a case where the stomach was found sphacelated; and the spleen, diaphragm, and lungs, and the parts adjacent to the affected portion of the stomach, were gangrenous. It may be stated, in a general way, that the lungs and the mucous membrane of the digestive canal, are the organs principally affected by this poison.—*Orfila,* vol. i. p. 177 to 180.

COPPER AND ITS PREPARATIONS.

The preparations of this metal are seldom used as the instruments of crime, but they are frequently poisonous through accident, owing to copper being extensively employed for domestic utensils. The preparations of copper, all poisonous to the human body, are,

Sulphate of copper, or blue vitriol.
Acetate of copper.
Subacetate of copper, or verdigris.
Muriate of copper.
Nitrate of copper.
Ammoniaret of copper.

[The weight of testimony is decidedly in favour of metallic copper not being poisonous when perfectly pure.—*Pharmacol.* p. 250.]

Symptoms. Acrid and coppery taste; tongue dried and parched; constriction of the throat; severe vomiting, or fruitless efforts to vomit; dragging at the stomach; dreadful colic; frequent bloody stools, with tenesmus; abdomen distended; pulse small, hard, and quick; syncope; great thirst and anxiety; cold sweats, sometimes jaundice; scanty urine; cephalalgia; vertigo; cramps; convulsions; and death.

Treatment. Give large draughts of milk-and-water, to encourage vomiting. Whites of eggs, stirred up with water and taken freely, and ferro-cyanate of potash, are considered by Orfila as antidotes. The in-

flammatory consequences are to be treated on general principles; and the nervous symptoms by anodynes and antispasmodics. Sugar is not a specific antidote, as Orfila first promulgated, though it may be advantageously given in coffee.

Tests. *Sulphuretted Hydrogen* decomposes it, and precipitates a brownish black sulphuret of copper. A very delicate test.

A clean plate of iron immersed in the solution becomes covered in a few hours with a coating of the metallic copper, and the blue colour of the solution passes first to green, and then turns to yellow.

Caustic Potash precipitates it of a sky-blue colour, in the form of hydrated peroxide.

Ammonia gives a blue precipitate; but if added in excess, the precipitate redissolves, and the liquor is of a most beautiful blue colour.

Arsenious Acid in solution with a little ammonia gives an abundant grass-green precipitate.

Chromate of Potash, a yellow precipitate.

The *Ferro-cyanate of Potash* in solution gives a brown precipitate. When very diluted, it will only produce a red colour in the mixture, without any turbidness; but at the end of about twenty minutes, the brown precipitate will fall. This is one of the most delicate tests of copper.

If the suspected substance be in powder, it should be mixed with charcoal, and heated to redness in an earthen crucible: metallic copper will be formed. The same process is proper when the fluid is com-

bined with substances which prevent the action of tests. Evaporate it to dryness, and then calcine with charcoal.

Morbid Appearances. The alimentary canal is the organ principally diseased. When death ensues within a few hours after taking the poison, the mucous lining of the stomach and intestines is found to be inflamed and gangrenous; and this extends even to the rectum. In one instance, the rectum was found pierced at two points. Sometimes the inflammation extends to all the coats, and sloughs are formed, which leave openings, through which their contents pass out, and are effused into the cavity of the abdomen. Inflammation of the brain has occasionally been noticed; and it has been remarked that the green colour of the salt tinges all the fluids contained in the *primæ viæ*. Yellowness of the skin has been frequently observed.

ZINC, (Sulphate and Oxide.)

The sulphate of zinc is liable, from its frequent use in medicine, to be taken by accident in improper doses. The property, however, which it possesses of readily exciting vomiting, will prevent, in most cases, any very serious consequences.

Symptoms. An astringent taste; sense of strangulation; nausea; copious vomiting; frequent stools;

pains in the epigastric region, extending afterwards over the whole of the abdomen; difficulty of breathing; frequency of pulse; paleness of the countenance; and coldness of the extremities; are the train of symptoms which result from taking this salt in large doses.

Tests. Potash and ammonia, with their carbonates, precipitate from it a white oxide, easily soluble in an excess of the latter alkali.

Ferro-cyanate of Potash causes a white precipitate.

Sulphuretted Hydrogen throws down a white precipitate, the sulphuret of zinc.

The precipitates should be evaporated to dryness, and all the solid substance formed may be mixed with caustic potash and charcoal, and then reduced by a high heat. After a considerable interval, metallic zinc is obtained.

Treatment. Vomiting, if not already excited, is to be promoted by administering warm water and emollient drinks. Milk is particularly proper, from its power of decomposing the sulphate. Inflammation must be guarded against; and irritation is to be allayed by anodynes.

*** The oxide of zinc can hardly be considered as a very deleterious substance. In large doses it produced vomiting in animals, and probably would have the same effect on the human system.

TIN.

In its metallic state, tin is not poisonous; but a preparation much used in the arts is highly deleterious, namely, the muriate of tin. There are no cases, we believe, on record, of death being produced on the human subject by the use of this substance; but from a narrative given by Orfila, on the effects of a small quantity taken by accident in food, it is evident that it may prove highly deleterious. Colic was produced in all the individuals, accompanied, in two of them, with diarrhœa.

Tests.. The addition of *corrosive sublimate* in solution produces a white precipitate with the peroxide, a black with the protoxide.

The Chloride of Gold gives a purple precipitate, the purple of Cassius.

The Hydrosulphurets render it turbid, and separate from it a blackish powder.

Antidote. From the experiments of Orfila, it is evident that milk acts as an antidote to this poison. It is completely coagulated, and the coagulum contains muriatic acid and oxide of tin, and is not deleterious.

NITRATE OF SILVER.

Symptoms. Similar to those occasioned by other corrosive poisons.

Treatment. A tablespoonful of common salt is to be dissolved in a pint of water, and a wineglassful to be taken every two minutes, to decompose the poison; after which, mucilaginous drinks may be given or purgatives administered.

Tests. When thrown on burning charcoal, nitrate of silver is decomposed. Vapours of nitric gas are given out, and the metallic silver remains upon the charcoal.

The solution stains the skin black.

Muriatic Acid and the soluble muriates precipitate the chloride of silver, which is white and curdled.

The Hydrosulphurets give a black sediment.

Arsenious Acid causes a yellow precipitate, which, on exposure to the air, becomes black; liquor ammoniæ should first be added, forming an ammoniacal nitrate, as has been mentioned under the tests for arsenic.

Fulminating Silver, according to the experiments of M. Pagot Laforet, also acts as a violent poison on animals in small doses. But, if charcoal mixed with water was administered in sufficient quantity immediately after the exhibition of the poison, the symptoms ceased, and no further injury was sustained.

GOLD.

Nitro-muriate of gold, injected into the jugular vein of animals, produced death, apparently by causing suffocation. The succession of symptoms in these cases were vertigo, deep respiration, plaintive cries, and occasionally vomiting. They expired in a few minutes after the operation.

Morbid Appearances. On dissection the lungs were seen gorged with blood, the heart was full of black blood, but the mucous membrane of the stomach and intestines was sound. Death also followed from taking this substance into the stomach, and the mucous membrane was, on dissection, found abraded in several places.

Antidotes. The sulphate of iron is recommended for this purpose by Dr. Thompson, from its property of decomposing the salt, and throwing down the gold in its metallic state. It instantly curdles milk. Chlorine decolorises the mixture with wine, and leaves the tests in operation in their usual manner. Orfila recommends the antiphlogistic treatment, and, in particular, the use of emollient and mucilaginous drinks.

Fulminating Gold appears to have proved highly deleterious in several cases quoted by Orfila from Plenck and Hoffman. Vomiting, spasms, diarrhœa, faintings, and death, were the consequences of the administration of a few grains (grs. iij. to vj.) Riverius mentions having found holes in the intestines of a child poisoned with it.

PLATINA.

There can be little doubt that the nitromuriate of platina, if taken internally, would prove a violent poison. Being, however, a raw article, and confined to the laboratory, it does not require any further notice here.

BISMUTH.

In the crystallized state, nitrate of bismuth was boiled in distilled water, and the fluid afterwards filtered. When this was injected into the jugular vein, it produced retching, plaintive cries, convulsions of the limbs, palpitation, difficulty of breathing, general depression, and death. The lungs were dark coloured, but turgid only in particular parts, or wrinkled. The left ventricle and arteries contained only a little black blood. The *subnitrate* produced, on being thrown into the stomach, vomiting of white ropy matter, deep and difficult respiration, trembling of the limbs, and death. The mucous membrane of the stomach was either highly inflamed or extensively ulcerated, so that the slightest friction separated it in the form of pulpaceous scraps. Portions of the lungs were gorged with blood.

Tests.—Sulphuretted hydrogen causes a black precipitate.

Ammonia gives a white precipitate.

Chromate of Potash, a beautiful orange colour.

Tincture of Galls, a flaky pale yellow.

On the addition of water, the fluid becomes milky, and a white precipitate gradually subsides.

The precipitates, on being calcined with charcoal in a crucible, afford the metal.

Antidotes. Milk and mucilaginous drinks; and the usual treatment, should inflammation supervene.

*** It is not yet clearly established, that the *white oxide of bismuth*, when pure, will cause any injurious effects.

IRON.

The sulphate of iron, in the hands of Dr. Smith, has proved an active poison to animals. When applied, in the dose of two drachms, to the cellular texture of the inside of the thigh of two dogs, it killed them in the course of twelve or fifteen hours. On dissection, the internal surface of the stomach of one of them was found covered with a multiplicity of petechial spots. The wrinkles of the rectum were numerous and black; the liver whitish, with livid spots on its convex surface; while the heart contained black grumous blood, and its ventricles some slight blotches. When introduced

into the stomach to the extent of two drachms, it did not destroy life in less than twenty-six hours, and without any other apparent symptoms than general insensibility; the interior of the stomach exhibited red spots; the small intestines presented blackish puffy swellings; and the upper part of the rectum showed red folds.

LEAD AND ITS PREPARATIONS.

There is a material difference between this metal and those already noticed, as regards its effects on the system. It frequently produces a constriction of the intestines, and hence has been styled an *astringent* poison, whilst the others have been characterized as *corrosive* or *acrid* ones. Inflammation is not an uncommon consequence of its exhibition. There are but few cases recorded of poisoning with acetate of lead. There is one in the New England Journal (vol. xvi. p. 86): it occurred in the person of a soldier, who drank a considerable quantity of the solution; he was soon seized with the most violent symptoms indicative of gastric inflammation.

Fatal effects have been known to follow the adulteration of gin with sugar of lead.* Instances are, however, stated where this salt in quantity has not

* Edin. Med. and Surg. Journ. vol. viii. p. 213, from Trans. Med. Soc. London.

produced any injurious effects.* And Dr. Beck has known a drachm to be taken without any bad consequences.

Symptoms. The usual symptoms from the taking lead internally, or any of its preparations, in large quantity, are—A sugary astringent metallic taste; constriction of the throat; pain in the region of the stomach; obstinate, painful, and often bloody vomitings; hiccup; convulsions, and death. When taken in small long-continued doses, it produces colica pictonum and paralytic symptoms.

In the solid form administered to animals, in doses from three drachms to an ounce or more, it excited vomiting, dejection, and death. The mucous membrane of the stomach was inflamed, and spots of a dark colour were observed on it; the intestinal canal and lungs were healthy. Given in solution, the effects produced were a loss of muscular power, trembling of the limbs, and vertigo. The mucous membrane was of an ash-grey yellow.

Water and other Substances impregnated with Lead. Metallic lead is readily converted into the state of carbonate of lead (cerusse) by the contact of aëratic water; and it is on this principle that the injurious effects frequently produced from drinking water which has remained for some time in reservoirs or pipes of this metal, is explained.

Litharge is another preparation of lead, as well as

* London Medical and Phys. Journ. vol. ix. p. 173, case by Mr. Hunter, of Dumbarton.

the carbonate, which has occasionally proved poisonous. The external application of lead is also instanced by medical writers as having proved deleterious; though these cases are by no means common; and different articles of food or drink may become contaminated with this substance. If the food contain any free vegetable acids or saline preparations, it will attack utensils made of lead and oxidize, and indeed, in some cases, dissolve them. This circumstance appears to have been known to the ancients. Earthen vessels glazed with lead are also very apt to be acted on by vegetable acids. Vinegar corrodes them, and if there be any article of food within, the oxide or acetate that is produced will mix with it; so will weaker acids. Milk has also acted on vessels of this description. Cider and wine adulterated by lead is very injurious. Rum will also act on lead. Even syrups, clarified by lead, contain a notable portion of this metal. And saturine emanations are well known to produce dangerous diseases; and these, of course, most readily affect workers in lead, as plumbers, painters, type-founders, printers, and potters.

Tests for Acetate of Lead.—Sulphuric Acid poured on it decomposes this salt, and gives a white precipitate of sulphate of lead, while the acetic acid is set at liberty, and may be detected by the smell.

Sulphuretted Hydrogen immediately blackens the solution of the acetate of lead, and throws down a black precipitate of sulphuret of lead.

Chromic Acid and the *chromate of potash* produce a beautiful canary-yellow precipitate.

Hydriodate of Potash throws down a yellow precipitate, the iodide of lead.

A piece of Zinc suspended in the fluid, will combine with the acid, and produce an arborescent deposit of metallic lead.

Subcarbonate of Soda instantly decomposes it, and precipitates from it protoxyd of lead, combined with carbonic acid. It is of a white colour. This test is much more exact than the former in detecting minute quantities.

Sulphate of Soda gives a white precipitate; also a very minute test.

The Alkaline Sulphurets precipitate the superacetate of a blackish colour.

Note. All the preparations of lead are easily reduced to the metallic state by calcination with charcoal. This mode of detection applies equally to all the oxides of lead, as litharge and minium.

Antidotes. The sulphates of soda and magnesia are the most useful remedies against the noxious effects of the salt of lead. They decompose the acetate in particular, and transform it into an insoluble sulphate of lead, which Orfila considers innoxious. He recommends the same treatment for the other preparations of this metal. The operation of these antidotes are to be assisted by diluents and purgatives, &c. The sulphuret of potash should never be administered either here or in any other case as an antidote, since it is itself a poison.

PHOSPHORUS.

The action of this substance is infinitely more violent when introduced into the stomach in a state of solution with oil. When introduced in small lumps, it does not at first induce any remarkable effect; but the animal falls gradually into depression, and dies.

Symptoms before, and appearances after death. The stomach is much inflamed, and contains a thickish green fluid; the mucous membrane is corroded, when not perforated; the lungs red, and distended with blood; in short, the usual symptoms are similar to those from concentrated acids.

Treatment. As inflammation is evidently the consequence of the exhibition of phosphorus, the appropriate antiphlogistics, of course, must be adapted to remedy it. An emetic must be premised, to remove, if possible, the poisonous ingredient; and water containing magnesia in a state of suspension is also advised, as tending to fill the stomach with fluid, and at the same time to neutralize the acid that is forming.

Tests. If phosphorus, or the rejected contents of the stomach after it has been taken, be boiled in a retort, having its beak under water, with a solution of caustic potash, phosphuretted hydrogen gas is formed,

which explodes with a green flame as soon as it reaches the surface of the water.

*** Dr. Thomson states (Annals, vol. xvi. p. 232), that if phosphorus be allowed to stand in water for some time, it will render the fluid poisonous to animals that drink it.

IODINE.

Orfila is the first who tried any experiments with this substance. He found that dogs, if they vomited freely, survived, although they had taken a drachm and upwards of it; but when vomiting did not occur, or if the œsophagus was tied, it invariably proved fatal, after exciting violent efforts to vomit, hiccup, thirst, quick pulse, and great depression. The mucous membrane of the stomach was always found corroded and ulcerated, but the lungs and other organs were found in their natural state. He also tried experiments with this substance upon himself from two to six grains. The latter dose instantly produced heat and constriction of the throat, nausea, irritation, salivation, and pain of the stomach; and in ten minutes from the time of taking it, copious bilious vomitings and slight colic pains; which yielded to two emollient enemata, after having continued an hour. The pulse rose from 70 to 90, and was fuller. The next day he felt only a slight fatigue. *Orfila*, vol. i. p. 490.

Iodine taken medicinally in large doses for a considerable period, produces in some constitutions very alarming symptoms, which sometimes arise gradually, but in others manifest themselves suddenly. This depends upon the fact of iodine being disposed to accumulate in the system for some time before the effect of the medicine is perceived. In many instances it has caused extreme emaciation, with absorption of the mamma in the female, and of the testicle in the male.

Hydriodate of Potash taken in large doses produces many symptoms like those occasioned by pure iodine, such as irritation and inflammation in the intestinal canal. Injected into the blood-vessels of animals, it has been observed to bring on tetanus, which was soon followed by death.

Tests. Hydriodate of potash is affected by many of the reagents which are employed in the detection of iodine.

Sulphuric acid poured upon the solid hydriodate produces a brown colour with effervescence, and, if heat be employed, the red iodine vapour will be separated.

The next test is a *cold solution of starch*, to which a few drops of sulphuric acid are to be added, when a beautiful blue colour will be produced. If the solution be in a very diluted state, the colour will evanesce on being heated, but will reappear if suddenly cooled, or if another drop or two of sulphuric acid be added: the solution is permanently deprived of its colour by sulphuretted hydrogen. The acid is added to disen-

gage the iodine from the hydrogen; the latter of which combines with a portion of oxygen of the acid, giving rise to the formation of water and sulphurous acid.

Acetate of Lead precipitates a beautiful yellow iodide of lead.

Oxymuriate of Mercury causes a carmine-coloured precipitate of the biniodide of mercury.

ACIDS.

Sulphuric Acid, or Oil of Vitriol.
Nitric Acid, or Aqua Fortis.
Muriatic Acid, or Spirit of Salt.
Oxalic Acid, or Acid of Sugar.
Phosphoric Acid.
Hydro-fluoric Acid.
Tartaric Acid.

Symptoms. An acid burning taste; severe pain in the throat, stomach, and bowels; frequent vomiting of black matter and bloody fluid; which effervesces with chalk or alkaline carbonates, and reddens litmus paper; hiccup; tenesmus; great tenderness of the abdomen; difficult breathing; irregular pulse; excessive thirst, drink increasing the pain and seldom staying down; frequent, but vain efforts to make water; cold sweats; altered countenance; convulsions, and death.

When either of the three first acids in the list have been swallowed, the lips are shrivelled and discoloured, yellow by nitric acid, and brown by the sulphuric; there are vesications about the mouth and the internal parts of the fauces; there are also, generally, red spots found upon the clothes. Oxalic acid exceeds all the other corrosive or irritating acids in the rapidity of its action. Death has been known to take place from it within half an hour, and, in rapidly fatal cases, is seldom protracted to twenty-four hours. In addition to the local injury, it acts immediately on the nervous system, diminishing the action of the heart and producing numbness down the back, loins, and extremities, even to the extent of paralysis.

In small repeated doses, oxalic acid appears to act as a narcotic.

Treatment. Mix an ounce of calcined magnesia with a quart of water, and give a wine-glass full every two or three minutes. Chalk, or soap and water, may be employed till magnesia can be procured, and if ever these are not at hand, the scrapings off the walls or ceilings may be used as a substitute. Carbonated alkalies are objectionable, on account of the salt formed with them being too irritating, as well as on account of the great extrication of gas, which they occasion in the stomach. Diluents and demulcents are to be taken after the poison is cleared out. Inflammatory and other symptoms to be combated as they occur.

As these poisons generally produce vomiting, emetics are not called for, and the tube of the stomach pump, if introduced, might produce great injury to the corroded and softened parts.

Tests. Sulphuric acid is known by its great weight, by evolving much heat when mixed with water, and by emitting no smell or fume.

The acid may be known when diluted, by adding to it a little nitric acid, then nitrate of baryta, which will cause a white precipitate insoluble in nitric acid; no other compound of barytes is insoluble in this acid.

When the clothes have been spotted by the acid, it is recommended to cut out the pieces and digest them for a short time in distilled water; the fluid may then be tested by litmus paper and nitrate of baryta.

Nitric Acid is known by emitting pungent fumes; upon the addition of copper, lead, or tin, to it, the acid is decomposed and nitric oxide is evolved, which, by uniting with the oxygen of the atmosphere, forms reddish fumes of nitrous acid gas.

Morphia added to nitric acid receives an orange-red colour in a few seconds, and, subsequently, forms a yellow solution with it.

Muriatic Acid emits pungent fumes, which form a white vapour when brought close to a rod dipped in caustic ammonia.

In the diluted state, it must be tested with litmus paper; then with nitrate of silver, which throws down a

dense white precipitate, the chloride of silver; but as this salt throws down similar coloured precipitates with other acids, its peculiar character must be attended to.

If the chloride of silver be in considerable quantity, on exposure to heat, it fuses below red heat, is not decomposed, and on cooling forms a semitransparent horn-like mass. The precipitate in a smaller proportion may be dissolved by ammonia, and made to reappear by nitric acid, of which an excess will not redissolve it. All the other white compounds of silver may be dissolved by nitric acid if they are soluble in ammonia.

Oxalic Acid is most liable to be mistaken for Epsom salts, from which it may be distinguished by its acid taste, Epsom salts being very bitter. It produces a red colour in litmus paper, which is not affected by the salts. The tests most depended on at present are four: ammonia, muriate of lime, sulphate of copper, and nitrate of silver.

Ammonia added to a rather concentrated solution of oxalic acid causes the formation of a radiated crystallization of oxalate of ammonia, which is less soluble than oxalic acid.

Muriate of Lime throws down a white precipitate of the oxalate of lime, soluble in a small quantity of nitric acid, but which requires a considerable quantity of muriatic acid for its solution.

Sulphate of Copper precipitates a bluish or greenish white oxalate of copper, insoluble in a few drops, but soluble in a large quantity of muriatic acid.

Nitrate of Silver throws down a white precipitate, the oxalate of silver, which has the property of fulminating when it is dried and heated.

Phosphoric Acid precipitates barytes and lime-water, and the precipitate is soluble in nitric acid. It is also decomposed by charcoal at a high temperature, evolving carbonic acid, and phosphorus is sublimed.

Fluoric Acid exhales white vapours, not unlike those of muriatic acid; heat is evolved with a hissing noise when water is added to it: it dissolves glass.

Tartaric Acid produces a precipitate from lime-water, soluble in an excess of acid, and also in nitric acid. With potash it forms a *neutral* and *super* salt; it does not precipitate solution of silver, but its salts do.

We are indebted to Dr. Tartra, of Paris, for an able and comprehensive Essay on the subject of Nitric Acid as a Poison. See Orfila, vol. i. p. 310, 311; also Edin. Med. and Surg. Jour. vol. x. p. 257.

CAUSTIC OR CARBONATED ALKALIES.

POTASH, SODA, AND AMMONIA.

When applied externally, pure potash is well known to act as a powerful caustic. On injecting a solution of it into the jugular vein, it produces sudden death; and on dissection the blood is found coagulated. When swallowed by an animal, it corrodes the stomach, and inflames its mucous membrane. Subcarbonate of

potash (salt of tartar) is also a poison of considerable activity.

Symptoms. The usual symptoms are a urinous and acrid taste; great heat in the throat; nausea, and vomiting of bloody matter, which changes syrup of violets to green, and effervesces with acids, if the carbonated form of the alkali has been taken; copious stools; acute pain of the stomach; colic; convulsions; and death.

Antidotes. Fixed oils, vinegar, and lemon juice, are the most valuable remedies for this purpose; and their use should be aided by mucilaginous drinks.

Tests. Alkalies have many properties in common with each other: their solutions feel soapy to the touch; change vegetable reds and blues to green, and yellows to brown; remain transparent when carbonic acid is added to them, which distinguishes them from solutions of the alkaline earths, barytes, strontia, and lime.

Potash is distinguished from soda by deliquescing, and forming deliquescent compounds.

It gives a yellow precipitate with muriate of platina.

Forms a salt with perchloric acid, which requires a great quantity of water for solution.

An excess of tartaric acid throws down supertartrate of potash.

The *Salts of Soda* are generally efflorescent, but it forms a deliquescent compound with perchloric acid.

Ammonia may be known by its pungent odour, and by its fumes, forming a white vapour with muriatic acid gas.

ALKALINE EARTHS.

Barytes and its Salts.
Carbonate and Muriate of Barytes.

These are all poisonous (except the sulphate). The muriate acts more violently than either the pure or carbonated barytes.

Symptoms. Barytes, whether pure or carbonated, when introduced into the stomach, produces vomiting, hiccup, insensibility, convulsions, and death. The stomach was found inflamed throughout its whole extent, and extravasations of black blood near the pylorus. The lungs and intestines were natural. *Orfila*, vol. i. p. 396.

Muriate of barytes, when injected into the jugular vein, caused great agitations and convulsions; and death ensued in six minutes after the operation. On dissection, the heart was found distended with coagulated blood; the stomach was natural, while the lungs were crepitating, and somewhat denser than usual. When applied to a wound in a state of powder, Mr. Brodie found it to produce vertigo, paralysis of the lower extremities, general insensibility, dilated pupils, convulsions, and death. The stomach and intestines were not affected. The lungs were exactly in the same condition as in the previous experiment. An overdose in the human system (seventy or eighty drops) excited violent purging and vomiting, loss of muscular

motion in the limbs, and coldness of the intestines, from which the patient did not recover for some days. *Med. Comment.* vol. xix. p. 156.

An ounce in solution, taken by mistake for Glaubers salts, produced instant vomiting, convulsions, pain in the head, and deafness. Death supervened within an hour from the time the poison was taken.

Antidotes. Sulphate of soda or magnesia is, according to Orfila, the proper remedy when early administered: these decompose the poison, and produce an insoluble sulphate of barytes.

Tests. *Carbonate of Barytes* is insoluble in water, and effervesces when dissolving in the nitric and muriatic acids.

Muriate of barytes is soluble in water, and is decomposed by the carbonates of potash and soda. Carbonate of barytes is precipitated.

Sulphuric acid throws down a white precipitate, insoluble in nitric acid.

Nitrate of Silver causes a precipitate of muriate of silver.

The hydrosulphurets do not affect its solution.

QUICKLIME.

Three drachms administered to a dog caused vomiting and dejection; and he died in three days, without having experienced either vertigo, convulsive motions, or paralysis.

Symptoms. The mouth, fauces, and œsophagus, were slightly inflamed, and the mucous membrane of the stomach was inflamed throughout its whole extent. The intestines and lungs were natural. A drachm and a half had been previously administered to the same animal (a small dog); it caused vomiting, and the discharge of much saliva, with some pain. The animal, however, recovered the next day.

Quicklime is thus evidently not a very powerful poison. Its chemical characters are well known, but, if any doubt exist, it must be calcined, in order to be reduced to a caustic state.

Tests. Carbonic acid with lime water gives a white precipitate.

Oxalic acid throws down a white precipitate, not insoluble in an excess of the acid.

It turns vegetable blues green.

The *treatment* is the same as that advised for persons poisoned by caustic, potash, and soda.

SULPHURET OF POTASH.

This substance (the liver of sulphur) formerly deemed an antidote of arsenic and corrosive sublimate, has been ascertained to be a powerful corrosive poison. Some of it was by mistake taken by a French countess, and she expired in a few minutes.

Symptoms. Introduced into the stomach of animals,

where the œsophagus was tied, produced violent attempts to vomit, hurried respiration, panting tetanic convulsions, and death. The stomach was found much inflamed, and covered over with yellowish white spots; the duodenum and jejunum were inflamed; the lungs were partially gorged; and the left ventricle contained black blood. Vomiting was excited when the gullet was not tied. The deduction made by Orfila, from the experiments made with this substance, is, that the corrosion excited by it is slighter in proportion as the dose is stronger, and the nervous phenomena will be much more severe. He also adds, that Magendie has observed, that when a drop of a strong solution of liver of sulphur is put into the mouth of a very young dog, the animal dies in a short time, and after death the trachea is filled with mucus.

Treatment. The chloride of soda and lime are the antidotes found most efficacious. Vinegar or lemon-juice, mixed with water, may be administered. This excites vomiting, and may decompose the poison. Inflammation should then be guarded against.

Tests. Liver of sulphur is decomposed by the acids, and sulphuretted hydrogen gas is given out. Corrosive sublimate, acetate of lead, nitrate of bismuth, and the salts of copper, all yield a black precipitate on the addition of a few drops of this substance; tartar emetic, an orange yellow one; and arsenious acid applied to a small quantity, gives a white precipitate, to a large quantity, a yellow one. *Orfila*, vol. i.p. 508.

NITRATE OF POTASH.

(*Nitre Saltpetre, Sal-Prunelle.*)

Saltpetre in large doses acts as an irritant poison, and cases illustrative of this effect are recorded by various writers. There are instances, however, of patients having recovered after large doses. The distinguishing properties of nitre are, its deflagrating when thrown on burning coals, and the disengagement of white vapours when sulphuric acid is added. The treatment consists in promoting vomiting, and protecting the stomach by means of mucilaginous drinks.

MURIATE OF AMMONIA.

(*Sal-Ammoniac.*)

Muriate of ammonia is poisonous when taken into the stomach, or applied in large quantities to wounds. It causes vomiting, convulsions, pain in the bowels, and death.

Treatment. Excite vomiting by warm water, or by irritating the throat. The nervous and inflammatory symptoms are afterwards to be combated in the usual way.

GLASS AND ENAMEL IN POWDER.

Formerly, this was deemed a highly poisonous substance. It has been experimented upon by various toxicologists on animals, and by some on themselves (Mandruzzato), with uniform results; from which it would appear that the substance in question can hardly be deemed a poison, at least, in the ordinary acceptation of the term. But there is no doubt that it may produce injury by its insolubility, retention, and mechanical properties. If the fragments be coarse or large, inflammation may arise from the irritation that is excited. Foderé (vol. iv. p. 115,) and Marc (p. 61) appear to consider it as a poison; and Metzger (p. 121) observes, "The similarity of the action of glass in large fragments, and of all other siliceous bodies, engages me still to place them in this class (Caustic Poisons). The treatment consists in eating large quantities of crumbs of bread, to envelope the particles; and afterwards an emetic of sulph. zinci."

VEGETABLE POISONS.

The Vegetable Poisons, of which it is now proposed to speak, present much greater obstacles to their discovery than those already considered. As far as hitherto known, there are scarcely any tests by which vegetable poisons can be detected, and their effects on the *primæ viæ* cannot in most cases be distinguished from those produced by various diseases. The symptoms are hence the leading guide in an investigation.

Vegetable Poisons are of three kinds: 1. The irritating, corrosive, or acrid. 2. The narcotic or stupifying. 3. The narcotico-acrid.

It may here be remarked, that vegetable poisons are seldom resorted to as the instruments of murder. When death is produced by them, it is generally the consequence of suicide or accident; the coroner, therefore, is the only legal officer whose examination is required.

Symptoms and Effects of Narcotic and Narcotico-Acrid Poisons. Having noticed the effects usually produced by an irritant corrosive or acrid poison, (see p. 6,) the following, on the other hand, are the symptoms observable where a narcotic poison has been swallowed: stupor; numbness; a great inclination to sleep; coldness and stiffness of the extremities; a cold sweat of a fœtid or greasy nature; swelling of the neck or face; protrusion of the eye, with a haggard cast of countenance; thickening of the tongue; frequent

vertigo; weakened eyesight, or objects presented to it in a fantastic manner; coma; delirium; general debility; palpitation of the heart; the pulse at first full and strong, but afterwards unequal and intermitting; paralysis of the lower extremities; retraction of the lips, general swelling of the body; and dilatation of the veins. At the conclusion of the disease, slight convulsions and pain are sometimes present. *Foderé*, vol. iv. p. 190. *Orfila*, vol. ii. p. 170, 515.

Continuing the same arrangement, it will be seen that the narcotico-acrid poisons are distinguished by a combination of several of the symptoms which characterize the corrosive or acrid, and the narcotic. They are, agitation; pain; acute cries; sometimes stupor and convulsive motions of the muscles of the face, jaws, and extremities; vertigo; and, occasionally, extreme stiffness of the limbs; contraction of the muscles of the thorax; eyes red and starting from their sockets; pupils frequently dilated; insensible to external impressions: mouth full of foam; tongue and gums livid; nausea; vomiting; frequent stools: these symptoms often attack in paroxysms, and the patient is left comparatively easy for a few moments.

The effects of narcotic poisons are generally stated to be the following: a rapid tendency to putrefaction, evinced by large spots on the skin, of a red or livid colour; a red swollen or livid countenance; flexible extremities; the blood in a fluid state, and effused in various parts, and the stomach and intestines covered with sphacelus; without any inflammation. (*Foderé*, vol. iv. p. 258.)

The corrections of several of these is contradicted by Orfila. He has frequently observed that putrefaction was no more advanced than usual at the expiration of twenty-four hours, or even thirty-six after death; that the limbs were as stiff as in those who had been poisoned by substances of another class, and that the blood was coagulated a short time after death.

On dissection no traces of inflammation were found by Orfila in the digestive canal of animals killed by narcotics, and he attributes such appearances to the subsequent administration of substances capable of producing inflammation. The lungs, however, present almost constantly livid and even black spots, and their texture is more dense and less crepitating. There is also not unfrequently distention of the veins of the brain.

As to the *effects of the narcotico acrids*, it may be remarked that there are some which are capable of exciting a severe inflammation, accompanied with ulceration or gangrene, while others do not inflame. The lungs, blood, brain, and other organs, present, in general, the same alterations that are induced by the narcotics.

IRRITANT OR ACRID POISONS.

The principal vegetable irritants or acrids are the following: elaterium, ricinus, jalap, euphorbia, colocynth, gamboge, savine, scammony, most species of ranunculus, colchicum, squill, œnanthe crocata, anemone, marsh-marigold, mezereon, daffodil, stavesacre, &c. To these might be added a long catalogue of plants, which some refer to the class of narcotico-acrids;

but which might with equal propriety be arranged here as many of those above enumerated.

Treatment of Persons who have taken these Poisons. As it would considerably exceed the limits to which these pages are circumscribed, to enumerate each article individually, the principal object being to study conciseness, the student is referred to works of greater magnitude, for, beyond what is already said on the subject, cases illustrating their effects on the human system and on animals.

As to the treatment of persons who have taken poisons of this class, all that can be offered are general observations. The early introduction of the stomach pump, vomiting, and the evacuation of the deleterious substance, are to be encouraged by mucilaginous drinks. Coffee is recommended by Orfila in cases where considerable stupefaction ensues. Inflammatory symptoms to be treated on antiphlogistic principles.

NARCOTIC POISONS.

These are defined by Orfila to be those which produce stupor, drowsiness, paralysis, or apoplexy and convulsions. Of these the principal are

Opium.
Hyosciamus Niger.
Taxus Baccata.
Prussic Acid.
Plants which contain Prussic Acid, Laurel-water.
Bitter Almonds, kernels of the peach.
Lactuca Virosa.
Solanum Dulcamara, &c.

As opium is the most frequently used as a poison, it may be particularly described in showing the action and treatment of narcotic poisons generally. The appearance and character of this drug are sufficiently known.

Symptoms. When opium or laudanum is taken in large quantities, the following symptoms are usually observed within a short time: insensibility and immobility; respiration scarcely perceptible; and a small and feeble pulse, which sometimes becomes full and slow. As the effects increase, the lethargic state becomes more profound; swallowing is suspended; the breathing is occasionally stertorous; the pupils are generally contracted by opium, dilated by other narcotics, and insensible to the application of light; the countenance is pale and cadaverous; and the muscles of the limbs and trunk are in a state of relaxation. Vomiting sometimes supervenes, and there is an occasional glimpse of returning animation; but the comatose state soon returns, and death, which is often preceded by convulsions, rapidly closes the scene.

Morbid Appearances. Although cases of death are numerous by this poison, the post-mortem examinations of the bodies have been comparatively few and imperfect. If opium or laudanum be taken in a large quantity, some portion of it will generally be found in the stomach and intestines; but the condition of these organs is usually not much varied from the healthy state. In a case quoted by Orfila, from Lassus, the stomach is said to have been inflamed. Red-brown patches have been seen in the arms, shoulders, and

nucha, the day after death; the face pale and the mouth filled with froth. There was a general congestion of black blood in the brain; the dura mater was injected; and even the capillaries gave out, on incision, minute drops of black blood. The heart and lungs were filled with the same, and the bronchiæ were reddish. The stomach was swollen, and red-brown patches at its fundus were apparent. The intestinal mucous membrane was minutely injected; the effect of congestion, and not of inflammation. The liver and spleen were gorged with blood; the bladder and kidneys were sound.—*See Beck's Med. Jurisp. Amer. Edit.* 534.

Treatment. It has been demonstrated by the experiments of Orfila, that the exhibition of vinegar or other vegetable acids, previous to the evacuation of the poison, will *accelerate and aggravate the action of the opium;* but when the opium has been previously expelled, water, acidulated with vinegar, or any other vegetable acid, will tend to diminish and correct the effects. Coffee, when prepared in the form of strong decoction or infusion, rapidly lessens the symptoms, but cannot be considered as an antidote. The results of his experiments, before the recent reintroduction of the stomach pump, led him to lay down the following directions for the treatment of persons poisoned by opium: namely, to induce vomiting, if possible, with sulphate of copper or sulphate of zinc; and the administration of all watery liquors to be prohibited, as they dissolve the opium and promote its absorption. The patient is directed to be blooded after the rejection

of the poison, and to be repeated, if necessary. Afterwards, water acidulated with vegetable acid, and a strong infusion of coffee, warmed, to be given alternately. And in ten or twelve hours a clyster is to be exhibited, and the arms and legs of the patient to be well rubbed. If it is suspected that any of the opium still remains in the large intestines, purgative clysters should be continued. The affusion of cold water on the head and over the body, must also, unquestionably, prove a valuable acquisition.

The treatment generally adopted at the present time is the following. If the stomach-pump be at hand, let diluents be introduced, and the stomach satisfactorily cleared out; if that cannot be obtained, administer a full dose of sulphate of zinc, that is, half a drachm, or two scruples; tickle the fauces if necessary, and dash cold water over the head, to excite the emetic action. The dose is to be repeated in a few minutes, if the first does not act. The patient is carefully to be kept roused, by active assistants, to prevent his falling into the lethargic state. After the stomach is amply freed from the poison, administer brandy and water, strong coffee, or the vegetable acids, and keep the patient awake for a few hours. Bloodletting as a general remedy is objectionable, as it increases the action of the absorbents.

The *tests* of opium are at present not quite satisfactory in establishing with certainty its presence in very small quantities. Those mentioned by authors on Toxicology, are the following:

Tests for meconic acid.

The *Permuriate of Iron* strikes a cherry-red colour in the solution.

Sulphate of copper gives a pale green precipitate, which is dissolved when the liquid is boiled, and again thrown down when it cools.

The following test has been recommended by Mr. I. T. Cooper, jun. in the Lancet, 1830-31. vol. 1. p. 712. "To the suspected solution, add a few drops of muriate of gold. If meconic acid alone exists, a black inky precipitate will be formed: if narcotine be present, or morphia in combination with meconic acid, on adding the solution, a fawn-coloured precipitate will be produced, which, by the subsequent addition of a few drops of caustic potash, will gradually deepen in colour until it becomes nearly black. Twenty drops of laudanum have been discovered, when diluted with a pint of water by these means."

Tests for morphia.

Nitric Acid poured upon morphia, produces an orange-red colour, which subsequently passes into a yellow. A similar effect is produced by this acid upon strychnine and brucine.

Permuriate of Iron forms with it, a solution of a greenish blue colour, which is deeper the greater the proportion of morphia.

Iodic Acid dissolved with morphia at ordinary temperatures, gives the solution a deep brown-red colour, and exhales an odour of iodine. It has been rendered evident in 7000 parts of water. This test has been recommended by M. Sèrullas.

PRUSSIC ACID.

This acid being so powerful and rapid in its operation, requires separate consideration from narcotics in general. In fatal doses it instantly produces violent convulsions, tetanus, coma, and death. In smaller doses the symptoms which have been most noticed are, nausea, stupor, pain in the head, vertigo, blindness, dilated pupil, insensibility to light, feeble irregular pulse, difficult respiration, spasms, and a distressing feeling of anxiety. Salivation has been repeatedly observed during its administration.

The post mortem appearances are so little differing from those under common circumstances, as to afford no criterion in deciding on this poison being administered. The most frequent peculiarity is the smell of the acid, which has been evident in the stomach, liver, lungs, brain, and blood, even for two or three days after death. The blood is generally very dark, and has an unusually blue tinge, and very much accumulated in the lungs, liver, and heart. Mertzdoff has seen, in some instances, the bile of a deep blue colour.

Treatment. The only remedies found capable of arresting the action of prussic acid, are diffusible stimulants, which therefore should be freely administered without loss of time.

The ammonia acts most beneficially if inhaled in a diluted state; chlorine also, inspired in a similar manner, is equally serviceable. The rest of the treat-

ment consists in cold affusion down the spine, and over the body generally.

Tests. *Its odour* is characteristic, somewhat resembling that of bitter almonds.

Sulphate of Copper throws down a greenish precipitate, which is rendered white, by adding a little muriatic acid. The acid must be first rendered alkaline by potash.

Sulphate of Iron added to the solution, previously rendered alkaline by potash, gives a greenish precipitate, which is rendered blue by adding a few drops of sulphuric acid.

Nitrate of Silver produces a white precipitate, insoluble in cold nitric acid; and this precipitate on being heated gives out cyanogen gas, which is known by the characteristic colour of its flame.

NARCOTICO-ACRID POISONS.

The principal and most common poisons of this class are the following:

Atropa Belladonna.	Cicuta Virosa.
Datura Stramonium.	Cusparia Ferruginea.
Nicotiana Tabacum.	Laurus Camphora.
Digitalis Purpurea.	Cocculus Indicus.
Conium Maculatum.	Poisonous Mushrooms.
Oil of Turpentine.	Æther.
Ergot of Rye.	Alcohol.

Lolium Temulentum,	Strychnos Nux Vomica.
Æthusa Cynapium.	——— Ignatia, &c. &c.

On a review of the poisons included in this class, it appears that greater diversity exists, both as to the symptoms and appearances on dissection, than in either of the former; still there seem to be leading characters which, as it were, subdivide it into four classes. Thus,

"Some are rapidly absorbed and carried into the circulation; those that experience their effects are in possession of nearly all their intellectual faculties; but the contraction of the muscles is such, that the thorax becomes immoveable, asphyxia takes place, and death is produced, without the least trace of redness being discovered in the digestive canal. *The upas tieuté*, the *bean of St. Ignatius*, and *nux vomica*, are of this description."

Some, again, produce a strong excitement of the brain, to which somnolency and loss of the intellectual faculty succeed. Inflammation of the digestive canal is rarely discovered. Of this class are *camphor* and *cocculus indicus*.

A third class produces excitement and lethargy, accompanied with a local irritation more or less intense; and to this belong *belladonna*, *tobacco*, *stramonium*, and *hemlock*.

In the last division are those which instantly destroy life, by acting on the nervous extremities; as the oil of tobacco. The third of these, Orfila remarks, is

alone *strictly* entitled to the appellation of *narcotico-acrid.* Vol. ii. p. 358.

Treatment. The general mode of proceeding to combat and diminish the effects of these poisons, consists in first administering an emetic to evacuate any of the noxious substance which may remain in the stomach, then giving castor oil and demulcents, and in some cases, enemas may be advisable. If the poison has been long taken, and much irritation or inflammation has supervened, blood-letting may be necessary; but it is more frequently requisite to administer diffusible stimulants, such as ammonia, æther, or brandy.

If the symptoms present more of the narcotic character, diluted acid drinks are indicated, and should be frequently repeated.

Digitalis is one of those medicines which are disposed to accumulate in the system, when taken in medicinal doses, and suddenly produce powerful depression of the heart's action. Should this arise, the recumbent posture must be observed, and diffusible stimulants be repeatedly administered, until the heart recovers some of its lost contractile power.

When a patient is in an alarming state of intoxication, emetics and irritating enemas are useful; and venesection is sometimes required. Acidulated drinks are subsequently beneficial.

ANIMAL POISONS.

Animal poisons are arranged by Fodéré and Orfila under the class of *septic* and *putrefying*, with the exception of the Spanish fly. Under the head of *poisonous serpents* may be enumerated the following:

The Viper, (*Coluber berus.*)
Black Viper.
Rattlesnake, (*Crotalus horridus.*)
Katuka Rekula Poda
Rodroo Pam.
Mockasin Snake
The Scorpion.
Tarantula.
Spiders.
Bees.
Wasps.
Hornets.

In general, the animal is most poisonous, and its effects most rapidly destructive, in warm climates. Hence the serpents of India and South America are distinguished above all others.

Symptoms. The symptoms produced by the bite of poisonous serpents are, a sharp pain in the wounded part, which soon extends over the limb or body; great swelling, at first hard and pale, then reddish, livid and gangrenous in appearance; faintings, vomitings, and convulsions, and sometimes gangrene; pulse small, frequent, and irregular; breathing difficult; cold perspiration; the sight fails; and the intellectual faculties become deranged.

Treatment. As to the supposed antidotes and the treatment proper for persons bitten by poisonous ser-

pents, it may be remarked, that they are both numerous and diversified. Humboldt and Bonpland mention a New Granada plant, (Methiana guaco,) the juice of which seems to deter snakes from biting persons on whom it is applied; and even when they are bitten, the application of the leaves prevents the usual effects. As such a specific as this, should it actually exist, is not at all times accessible, it is usually recommended to apply a ligature moderately tightened above the bitten part, and to allow the wound to bleed, after being well bathed and fomented with warm water. The actual cautery, lunar caustic, or butter of antimony, is then to be freely applied to the wound, which is afterwards to be covered with lint, dipped in equal parts of olive oil and spirits of hartshorn. The ligature to be removed if the inflammation be high. Warm diluting drinks, and small doses of ammonia, or hartshorn, are to be exhibited from time to time to promote perspiration; the patient to be well covered up in bed, and a little warm wine occasionally given. Should gangrene threaten, wine may be administered more freely, and the bark given. Arsenic, the principal ingredient in the Tanjore pill, has been strongly recommended; and Fowler's solution has been used in the West Indies, by Mr. Ireland, to counteract the effects of bites of snakes. Ammonia has many testimonials in its favour, although its specific virtues are doubted. They are, however, useful in promoting perspiration. The Polygala senega, Aristolochia serpentaria, and others, have acquired a temporary reputation. Caustics are valuable,

but often prove ineffectual; the ligature, and excision of the wounded parts, afterwards cauterised, are most to be relied on.

In the natural history of the serpent tribe, it is worthy of remark that poisonous snakes have tubular fangs, but only one row of teeth on each side of the upper jaw, while the innocent tribe have two. In the former, the scales decrease in size as they approach the head, while the reverse obtains in the latter. The viper of this country has a dark lozenge-shaped streak running down the back.

The scorpion and centipede are most venomous in southern countries. The tarantula produces similar effects, local rather than general. The bite of the spider is also said to have caused local inflammation. The sting of the bee, the humble bee, the wasp, and the hornet, have each occasionally produced dangerous and alarming symptoms. The sting and bites of this tribe are to be treated according to the violence of their effects. There is a species of the first kind, it would appear, whose sting may prove fatal; and cases are related to this effect; and where scarifications, the actual cautery, oil externally and internally, and ammonia, were all tried in vain. Generally, however, emollient anodyne applications to the injured part are sufficient to allay the irritation occasioned by the less noxious, after extracting the sting. In severe cases, volatile alkali is a valuable medicine.

The best mode of treatment for the bites of rabid animals, or punctured wounds from dissection, consists in first applying a cupping-glass, forming a vacuum

over the wound, and thus, for the time, preventing absorption. This remedy has been particularly recommended by Dr. Barry. After a short time the parts should be excised, and the glass reapplied to extract the blood from the divided vessels which might possibly contain any of the poisonous fluid; afterwards the wound is directed to be cauterized, poulticed, and made to heal by granulations.

POISONOUS FISHES.

Numerous cases are on record of the poisonous nature of various species of fish, and particularly in the West Indies. Dr. Burrows has furnished a catalogue of them, which it may be useful to quote:

Balistes monoceros,	(*Old Wife.*)
Ostracum globellum,	(*Smooth Battle-fish.*)
Tetrodon sceleratus,	(*Tunney.*)
Tetrodon ocellatus,	(*Blower, or Blazer.*)
Muræna major,	(*Congor Eel.*)
Coryphœna splendens,	(*Dolphin.*)
Sparus chrysops,	(*Porgee.*)
Coracinus fuscus major,	(*Grey Snapper.*)
Perca major, of Brown,	(*Esox Barnacuda.*)
Coracinus minor,	(*Lyne.*)
Perca venenata,	(*Rock-fish.*)
——— of Catesby,	(*Grooper.*)

Scomber maximus,	(*Xiphias*, of Brown, King-fish.)
Scomber thynnus,	(*Boneta*.)
Some other species of Scomber.	
Mormyra of Brown,	(*Blue Parrot-fish*.)
Clupea thryssa,	(*Yellow-billed Sprat*.)
Cancer astacus,	(*Sea-lobster*.)
Cancer runcolus,	(*Land-crab*.)
Mytilus edulis,	(*Muscle*.)

Of all these, the yellow-billed sprat is the most active and dangerous.

Symptoms. In an hour or two, or oftener in a shorter space of time, after eating stale fish, a sense of weight at the stomach comes on, with nausea, vertigo, and head-ach; heat about the head and eyes; colicky pains, and considerable thirst; often an urticarious eruption of the skin; and in some cases death. The yellow-billed sprat is said to be the only fish that produces immediate death. Whites and negroes have both been known to expire at St. Eustatius and other of the Leeward islands, with the sprats in their mouth, unswallowed. The grey snapper produces cholera and excruciating pains, and is apt to leave a weakness of the lower extremities, dimness of sight, and dulness of hearing.

Treatment. An emetic (of sulphate of zinc) or cathartic should be instantly administered, according to the time elapsed since the insertion of the poisonous substance; if, however, the spontaneous vomiting and purging be very great, it may sometimes be necessary

to check these symptoms by anodynes, which are also proper when spasms supervene. And for the *sequela*, Dr. Chisholm advises a solution of alkalies in water. Sugar, containing a few drops of sulphuric ether, has also been recommended. See *Edin. Med. and Surg. Journ.* vol. iv. p. 445.

Muscles sometimes produce effects analogous to those related, and death has occasionally been the consequence in weak females and children. Oysters, crabs, lobsters, mackerel, sprats, may, from a variety of causes, occasion similar sensations. The treatment in all these cases must be similar to that already advised for poisonous fishes generally.

It has been lately discovered that the spur of the *Ornithorynchus paradoxus*, (*duck-billed platybus*, of New Holland,) is hollow, and connected with a cyst, through which a poisonous fluid is injected into the wound which the animal makes. It causes inflammation and swelling, but does not prove fatal.

As to the venomous nature of the *toad*, various and contradictory opinions have existed. It is doubted at the present day, though it was formerly believed.

The pheasant of Pennsylvania, a partridge as it is sometimes called, is deemed poisonous during the winter and spring; and the causes assigned for this animal paradox, is its feeding during these seasons on the buds of the laurel, (Kalmia latifolia,) which is one of the few shrubs that preserves its verdure throughout the cold season.

It has been long known that honey is occasionally poisonous. Many of the ancient writings contain facts

on this subject; and, in particular, a number of the Greek soldiers, during the retreat of the Ten Thousand, are said to have been violently affected by some they had eaten near Trebisond.

Besides the poisons here considered of the animal kind, there are others enumerated by systematic writers. Of this description are poisonous animals, used as food, as oxen, sheep, &c. in whom the fluids have been depraved by diseases and *rabies*. Those arising from punctures on dissection, may also come under this head, and the many recent instances of death from this cause are too well known to require any comments. These cases are sufficient to show the danger that sometimes follows from a puncture during dissection. Whether this danger is aggravated by a peculiar condition of the system, is, in some degree, still undetermined; though it is not improbable that the effects may be exacerbated in cases where there is a previous predisposition to disease, either of a temporary or constitutional nature.

AERIAL POISONS.

From this class of poisons death is more frequently the result of accident rather than design; being caused by inhaling the pernicious fumes of certain metals, charcoal, coke, or fermenting liquors; as well as from sleeping in close unventilated apartments, or respiring the foul air of wells, privies, cellars, caverns, &c.; places which should never be entered immediately when opened, if they have been shut up for any length of time. As a precaution, a lighted candle or torch should first be let down, for, where these will not burn, animal life cannot be long sustained.

A vast proportion of the gases discovered by modern chemists are inexpirable. Few of them, however, are spontaneously generated, and their noxious power must be extremely circumscribed. There are some of these gases, nevertheless, which may be produced under ordinary circumstances, or are occasionally the results and accompaniments of peculiar situations and occupations; and of these none is more deleterious than carbonic acid gas. This substance may be generated in various ways.

1. When a number of persons have remained during a long time in an apartment, or any other place where the air is not renewed, they mutually vitiate the air, and produce, by the process of respiration, the poison

in question. A most striking and melancholy instance of this occurred at Calcutta in 1756.

2. The fumes of burning charcoal consist principally of this substance and carbonic oxide. This is, unfortunately, a frequent cause of death. Persons, on going to bed, leave pieces of it burning in their apartments, and, in the morning, are found lifeless.

3. Carbonic acid gas is contained in the exalations from lime-kilns; and cellars, where wine, beer, or other liquors, are in a state of fermentation. Hence the danger of sleeping near the former, and the necessity of ventilating the latter.

4. This gas is also frequently generated in wells marshes, and mines. In the latter, however, a different substance is also generated, called the *fire-damp*, or carburetted hydrogen gas, which is no less deadly. But the frequency of fatal accidents to persons descending wells, is to be ascribed to carbonic acid.

Persons affected by this agent, feel a great heaviness or pain in the head; intolerable singing in the ears; a great disposition to sleep; and so great a loss of strength as to be unable to support themselves in the erect posture; difficulty of breathing; and violent palpitation of the heart; followed by a suspension of the respiration and circulation. The senses no longer exercise their functions, and sensibility appears to be extinct.

[*The contents of the following pages are chiefly extracted from the Directions printed by order of the Royal Humane Society.*]

ON ASPHYXIA, AND THE TREATMENT OF SUSPENDED ANIMATION.

Asphyxia means that state of the body during life in which the pulsation of the heart and arteries cannot be perceived; several species of which are enumerated by authors, as arising from some of the following causes: hysterics; excessive cold; immersion under water; suspension by the neck; lethargy. These may destroy all appearances of vitality, without extinguishing life. Wherever, therefore, the vital functions are suspended from any of these or other causes, as well as in cases of sudden death, the body ought not to be too soon committed to the grave, as there are many well-attested instances of individuals having been buried before the extinction of the vital spark. The following methods of treating suspended animation, ith a view to resuscitation, have met with the decided approbation of the faculty of medicine, and the concurrent testimony of philosophers.

CAUTIONS TO BE OBSERVED RELATIVE TO PERSONS FOUND DROWNED.

1. Lose no time.
2. Avoid all rough usage.
3. Never hold the body up by the feet.
4. Do not roll the body on casks.
5. Nor rub the body with salt or spirits.
6. Nor inject tobacco smoke.

Send quickly for medical assistance, but do not delay the following means:

1. Convey the body carefully, with the head and shoulders in a raised position, to the nearest house.

2. Strip the body and rub it dry, then wrap it in hot blankets, and place it in a warm bed in a warm room.

3. Wipe and cleanse the mouth and nostrils.

In order to restore the natural Warmth of the Body,

1. Move a heated covered warmingpan over the back and spine.

2. Put bladders or bottles of hot water or heated bricks to the pit of the stomach, the armpits, between the thighs, and to the soles of the feet.

3. Foment the body with hot flannels, but, if possible, immerse the body in a warm bath, as hot as the hand can bear without pain, as this is preferable to the other means of restoring warmth.

4. Rub the body briskly with the hand; though, at the same time, the other means must not be given up or relinquished too soon.

To restore Breathing.

1. In order to restore breathing, introduce the pipe of a common bellows (where the apparatus recommended by the Royal Humane Society is not at hand) into one nostril, carefully closing the other and the mouth; at the same time drawing downwards and pushing gently backwards the upper part of the windpipe, to allow a more free admission of the air: blow the bellows gently, in order to inflate the lungs, till the breast be a little raised; the mouth and nostrils should then be set free, and a moderate pressure made with the hand upon the chest. This process is to be repeated till life re-appear.

2. Electricity is to be employed by a medical assistant.

3. Insert into the stomach, by means of an elastic tube and syringe, half a pint of warm brandy and water, or wine and water.

4. Apply sal volatile, or hartshorn, to the nostrils, &c.

If apparently Dead from Intense Cold,

1. Rub the body with snow, ice, or cold water.

2. Restore warmth by slow degrees; and, after some time, if necessary, employ the means recommended for the drowned. In these accidents it is highly dangerous to apply heat too early.

From Noxious Vapours, Lightning, &c.

1. Remove the body into a cool fresh air.

2. Dash cold water on the neck, face, and breast, frequently.

3. If the body be cold, apply warmth, as recommended for the drowned.

4. Use the means recommended for inflating the lungs.

5. Let electricity, particularly in accidents from lightning, be early employed.

From Hanging.

In addition to the means recommended for the drowned, venesection should be early resorted to.

From Intoxication.

1. Lay the body on a bed, with the head raised.

2. Remove the neckcloth, and loosen the clothes. Obtain immediate medical assistance, as the treatment must be regulated by the state of the patient; but, in the mean time, apply cloths soaked in cold water to the head; and bottles of hot water, or hot bricks, to the feet and calves of the legs.

From Apoplexy.

The patient should be placed in a cool air, and the clothes loosened, particularly about the neck and breast. Bleeding must be early employed by a medical assistant; regulating the quantity by the state of the pulse. Cloths soaked in cold water, spirits, or vinegar-and-water, continually applied to the head, which should be immediately shaved. All stimulants should be avoided.

In cases of coup-de-soleil, or strokes of the sun, the same means are to be used as those recommended in apoplexy.

General Observations. On restoring the individual to life, a teaspoonful of warm water should be given; then, if the power of swallowing be returned, small quantities of warm wine, or weak brandy-and water, warm; the patient should be kept in bed, and a disposition to sleep encouraged, except in cases of apoplexy, intoxication, strokes of the sun, &c. Great care is requisite to maintain the restored vital actions, and, at the same time, to prevent undue excitement. The treatment recommended is to be persevered in for three or four hours, or even longer.

DESCRIPTION OF THE PLATES

REPRESENTING THE PRINCIPAL

VEGETABLE POISONS,

WHICH ARE INDIGENOUS OR COMMONLY GROWING IN GARDENS.

(To face Title Page.)

ACONITUM NAPELLUS.

MONKS'-HOOD, OR WOLF'S BANE.

Class 13. Polyandria. *Order* 3. Trigynia.

Natural Order. Multisiliquæ, Linnæi; Ranunculaceæ, *Jussieu.*

Generic Character. Calyx none. Petals five, the highest arched, nectaries two, peduncled, recurved. Pods three or five.

Specific Character. Divisions of the leaves linear, broader above, and scored with a line.

* The nectaries and stamens.

This plant is a native of France, Italy, and Switzerland. It is cultivated in our gardens, flowering in May and June, and ranks amongst the acrid vegetable poisons.

All parts of this plant are poisonous. Its deleterious properties depend on a peculiar alkaline base, named by Mr. Brande, Aconita.

Steggall, del.

Ward, lith. 14 Earl St. Finsbs.

Atropa Belladonna.

ATROPA BELLADONNA,

(DEADLY NIGHTSHADE. DEADLY DWALE. BLACK CHERRY.)

Class 5. Pentandria. *Order* 1. Monogynia.

Natural Order. Luridæ, Linn.; Solanaceæ, *Juss.*

Generic Character. Corolla bell-shaped. Stamens distant. Berry globular, two-celled.

Specific Character. Stem herbaceous. Leaves ovate, entire.

* The corolla opened.
** The berry.

Deadly nightshade grows wild in some parts of this country. It flowers in June and July, and ripens its berries in September. It is a narcotico-acrid poison. The deleterious properties reside chiefly in the leaves and fruit, and depend on a salifiable base, called *Atropine.*

Conium maculatum.

CONIUM MACULATUM,

(COMMON, OR SPOTTED HEMLOCK.)

Class 5. Pentandria. *Order* 2. Digynia.

Natural Order. Umbellatæ, Linn.; Umbelliferæ, *Juss.*

Generic Character. Involucels three-leaved, all on one side. Petals cordate. Fruit nearly globular, five-ribbed and furrowed; the ribs are crenate.

Specific Character. Stem much branched, smooth, and spotted. Leaves tripinnate

* A blossom magnified.

** A seed.

Common hemlock is an indigenous plant, growing by road sides, and flowering in June and July. The diagnostic characters of this plant are, its involucrum, consisting of from three to seven leaflets; its involucels formed of three leaflets, which are situated at the outside of the pedicels; its smooth, spotted stem; and its seeds being notched in their circumference.

It ranks amongst narcotic poisons, its deleterious properties residing in a peculiar salifiable base, called *Conein.*

COLCHICUM AUTUMNALE,

(COMMON MEADOW-SAFFRON.)

Class 6. Hexandria. *Order* 3. Trigynia.

Natural Order. Spathaceæ, *Linn.*; Junci, *Jussieu.*

Generic Character. Calyx none. Corolla six-parted, tubular. Capsules three, inflated. Seeds numerous.

Specific Character. Leaves flat, lanceolate, erect. Segments of the corolla oblong.

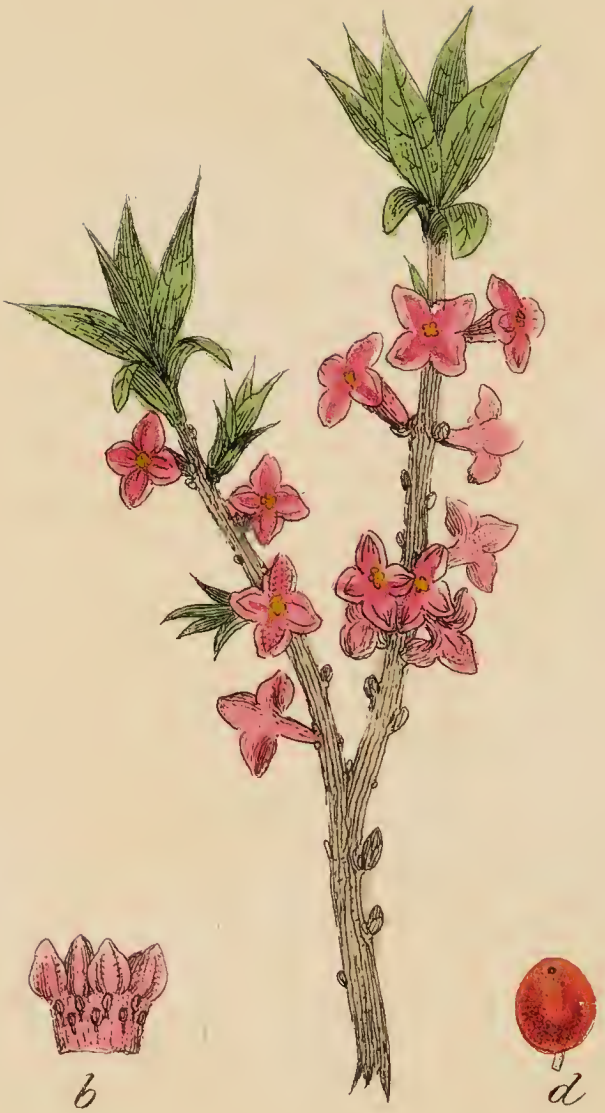
b. The capsules.
d. The bulbiferous root.

This plant grows abundantly in some parts of England, flowering in autumn. It is remarkable, that the blossoms appear without the leaves, which, with the capsule and seeds, show themselves in the spring.

Colchicum is classed amongst the acrid poisons.

Its deleterious properties reside in the bulbs and seeds, and depend on an alkaloid base, named *Veratrine.*

Colchicum Autumnale.



Daphne Mezereum.

DAPHNE MEZEREUM,

(COMMON MEZEREON, OR SPURGE-OLIVE.)

Class 8. Octandria. *Order* 1. Monogynia.

Natural Order. Vepreculæ, *Lin.* Thymaleæ, *Juss.*

Generic Character. Calyx coloured, inferior, four-cleft. Berry one-seeded.

Specific Character. Flowers sessile in threes on the stem. Leaves lanceolate deciduous.

b. The corolla laid open.
d. The berry.

Mezereon grows wild in some parts of England, flowering about the end of February or beginning of March.

This plant acts as an acrid poison, its deleterious properties residing principally in the bark of the root.

Datura Stramonium?

DETURA STRAMONIUM,

(THORN APPLE.)

Class 5. Pentandria. *Order* 1. Monogynia.

Natural Order. Luridæ, Linn.; Solaneæ, Juss.

General Character. Corolla funnel-shaped, plaited. Calyx tubular, angular, deciduous. Capsule two-celled, four-valved.

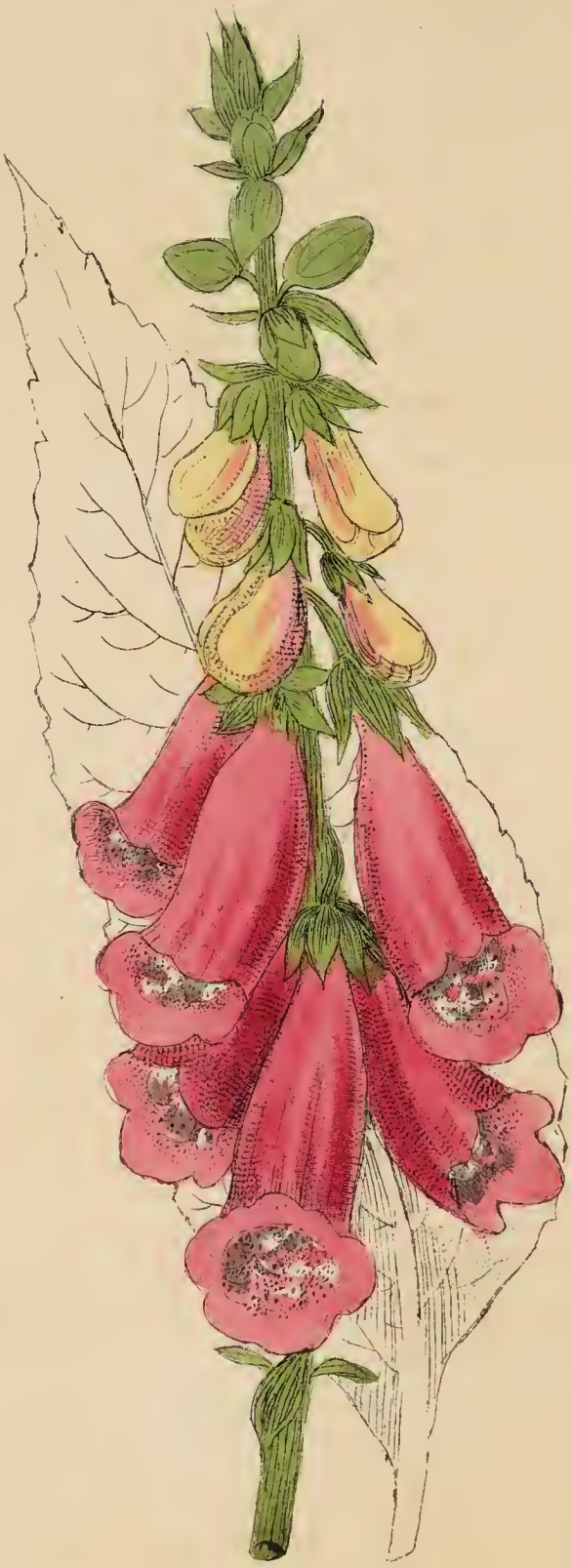
Specific Character. Pericarp, spinous, ovate, erect. Leaves ovate glabrous.

The thorn-apple is a native of America, where it is known by the terms Apple of Peru, Devil's apple, Jamestown weed.

It grows wild at present, in many parts of this country.

It is classed amongst the narcotic vegetable poisons.

Its deleterious qualities reside in a salifiable base, called *Daturine*, which resembles *Atropine* very much in its properties.



Digitalis purpurea

Steggall Del.

DIGITALIS PURPUREA,

(PURPLE FOX-GLOVE.)

Class 14. Didynamia. *Order* 2. Angiospermia.

Natural Order. Luridæ, Linn.; Scrophulariæ, Juss.

Generic Character. Calyx five-parted. Corolla bell-shaped, five-lobed, ventricose beneath. Capsule ovate, two-celled.

Specific Character. Segments of the calyx ovate, acute. Corolla obtuse, upper lip undivided. Leaves downy.

Fox-glove is a very common indigenous plant, flowering in June and July. It is a narcotico-acrid poison; its active principle is called *Digitaline.*

Helleborus Fœtidus.

HELLEBORUS FŒTIDUS,

(FŒTID HELLEBORE, BEAR'S FOOT, OR SETTER-WORT.)

Class 13. Polyandria. *Order* 6. Polygynia.

Natural Order. Multisiliquæ, Linn.; Ranunculaceæ, Juss.

Generic Character. Vide Hell. niger.

Specific Character. Stem many-flowered, leafy. Leaves pedate, glabrous. Petals converging.

* The nectaries surrounding the base of the stamens.
** The capsules.

Fœtid Hellebore is an indigenous perennial plant, growing principally on a calcareous soil. It flowers in March and April.

It is classed amongst the acrid irritating poisons. The entire plant possesses poisonous properties.

Helleborus Niger.

HELLEBORUS NIGER,

(BLACK HELLEBORE, OR CHRISTMAS ROSE.)

Class 13. Polyandria. *Order* 6. Polygynia.

Natural Order. Multisiliquæ, Linn.; Ranunculaceæ, Juss.

Generic Character. Calyx ovate. Petals five or more. Nectaries bilabiate, tubular. Capsules many-seeded, nearly erect.

Specific Character. Leaves pedate. Flower-stalks radical, one or two flowered. Bracteas ovate.

The Black Hellebore, or Chrismas Rose, is a native of Greece and Italy, and grows freely in our gardens, blossoming from December till March. The term *black* is given on account of the colour of the roots. It is an acrid poison in large quantities; the root being the part most deleterious.

Hyoscyamus niger.

HYOSCYAMUS NIGER,

(COMMON HENBANE.)

Class 5. Pentandria. *Order* 1. Monogynia.

Natural Order. Luridæ, Linn.; Solaneæ, Juss.

Generic Character. Corolla funnel-shaped, the lobes obtuse. Stigma capitate. Capsule covered with a lid, two-celled.

Specific Character. Leaves sinuate, amplexicaul. Flowers sessile.

Henbane is a common indigenous annual plant, flowering in July. It ranks with the narcotic poisons; its deleterious properties residing in its salifiable base or alkaline principle, named *Hyoscyamine*.

The term *niger* is derived from the colour of the seeds.

Lactuca Virosa.

LACTUCA VIROSA,

(STRONG-SCENTED LETTUCE.)

Class 19. Syngenesia. *Order* 1. Polygamia Æqualis.

Natural Order. Compositæ Semiflosculosæ.

Generic Character. Receptacle naked. Calyx imbricated, cylindrical. Its scales are membranous at their margins. Pappus simple, stipitate.

Specific Character. Leaves horizontal, toothed; the keel prickly.

Lactuca virosa is a biennial plant, indigenous to Great Britain. It is a narcotic poison if taken in large doses.

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Solanum Dulcamara

SOLANUM DULCAMARA,

(WOODY NIGHTSHADE, OR BITTER-SWEET.)

Class 5. Pentandria. *Order* 1. Monogynia.

Natural Order. Luridæ, Linn.; Solaneæ, Juss.

Generic Character. Corolla wheel-shaped. Anthers opening with two pores at the apex. Berry two celled.

Specific Character. Stem flexible, without thorns. Upper leaves hastate. Corymbs drooping.

The berry.
** The anthers.

Woody Nightshade is an indigenous plant, flowering from the month of June to September. All parts of this plant are deleterious; possessing the properties of narcotic poisons.

There is another species, growing wild by the roadside, which bears white flowers, named the Solanum Nigrum, from the colour of its berries. The common potato plant is a species of solanum. Its specific term is *Tuberosum.*

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BY

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